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TRINIDAD AND TOBAGO.

ADMINISTRATION REPORT

OF THE

DIRECTOR OF AGRICULTURE

FOR THE YEAR 1936.

1937.
TRINIDAD AND TOBAGO.
PRINTED AND PUBLISHED BY A. L. RHODES, M.B.E.,
GOVERNMENT PRINTER.

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Council Paper No. 47 of 1937.

DEPARTMENT OF AGRICULTURE.

Administration Report of the Director of Agriculture for the year 1936.

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REPORT OF THE DEPARTMENT OF AGRICULTURE FOR THE YEAR 1936.

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DEPARTMENT OF AGRICULTURE.

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I.—AGRICULTURAL EXPORTS.

During the year 1936 the total value of the agricultural produce exported was £2,066,263 as compared with £1,696,423 in 1935.

2. Prior to the world wide depression in the prices of primary products, the total value of the agricultural exports of the colony was somewhat under £3,000,000. In the year 1930 there was a sharp decline and by 1934 the agricultural exports had fallen in value to £1,511,051. In 1935 there was an increase of £185,372; in 1936 the upward trend was accelerated, and the excess over the previous year was £369,840 with the result that the £2,000,000 mark was reached for the first time in the past six years.

3. Sugar and its by-products headed the list of exports with a value of £1,338,651 or £360,926 more than in 1935; cocoa fell in value from £527,212 to £487,578; coconuts and coconut by-products increased from £50,414 to £67,670 and exports of grapefruit were valued at £41,357 as against £42,473 in 1935.

Agricultural Exports.

Article.	1926-1928 average yearly value.	1935 Value.	1936 Value.
	£	£	£
Sugar and by-products	1,014,677	977,725	1,338,651
Cocoa	1,531,148	527,212	487,578
Coconuts and Coconut products	223,768	50,414	67,670
Coffee	12,833	18,290	17,702
Limes and lime products	6,056	18,398	26,852
Grapefruit and oranges	2,028	49,047	46,111
Grapefruit and orange juices	—	502	4,080
Bananas	—	6,205	14,797
Tonka beans	1,824	12,320	31,002
Pulses, Beans and Peas	4,816	2,628	2,600
Livestock and Hides	8,441	4,446	7,436
Bitters	76,862	28,055	15,953
Miscellaneous	20,192	1,181	5,831
	2,902,645	1,696,423	2,066,263

SUGAR.

Sugar Production.

4. The 1936 sugar crop, which amounted to 154,665 tons, constituted a record for the colony being 36,885 tons in excess of the 1935 crop and 33,902 tons more than the former record crop of 1933. Production figures for the past ten years are as follows:—

	Tons.
1927	51,982
1928	81,551
1929	89,926
1930	79,848
1931	98,573
1932	97,598
1933	120,763
1934	105,342
1935	117,780
1936	154,665

Exports and Values of Sugar and Sugar By-products.

5. The quantities and values of the exports of sugar, rum and molasses for the years 1927-1936 are given below. In addition to the amount exported some 12,000 tons are consumed annually in the colony.

	Sugar.		Molasses.		Rum.		Prices Grey Crystals f.o.b. per ton.
	Exports.	Value.	Exports.	Value.	Exports.	Value.	
	Tons.	£	Gals.	£	Gals.	£	£ s. d.
1927	41,805	762,366	1,188,840	14,471	35,699	8,155	16 10 0
1928	74,112	1,201,477	1,622,018	16,913	55,088	12,157	14 10 0
1929	81,503	1,049,863	1,373,420	18,227	73 841	13,639	11 10 0
1930	69,138	776,167	899,051	11,238	72,063	14,313	10 5 0
1931	86,054	902,990	1,599,414	15,924	86,260	15,719	9 0 0
1932	85,956	845,974	2,701,921	14,697	139,540	27,521	9 14 2
1933	108,516	1,115,567	3,026,077	31,634	63,907	12,853	9 10 0
1934	93,513	916,232	2,310,381	24,115	50,977	11,488	8 13 10
1935	105,699	942,171	3,199,524	32,226	6,282	3,328	7 12 6
1936	142,671	1,276,579	3,909,009	41,623	90,185	20,449	7 14 7

Prices of Sugar.

6. As shown in the above table, there was little recovery in the price of sugar during the first half of 1936, the average f.o.b. price per ton of grey crystals being £7 14s. 7d. for the six months January to June as compared with £7 12s. 6d. for the corresponding period of the previous year.

Cane Farming Industry.

7. A striking increase in the tonnage of canes sold by cane farmers was recorded for 1936 when the factories purchased 594,176 tons of cane as against 402,287 tons in 1935. The basic price paid by the factories for farmers' canes was 11s. per ton and cane farmers received a total of £326,796 as compared with £221,226 in the previous year.

8. During 1936 there were 19,471 cane farmers of whom 13,318 were East Indians and 6,153 West Indians. Of the total cane crop produced 56 per cent. was estate grown and the balance—44 per cent.—was produced by cane farmers.

Importance of Sugar Industry.

9. In recent years the sugar crop has played an increasingly important part in mitigating the economic difficulties that have followed on the decline in the value of cocoa exports ; and the witch-broom menace of cocoa points clearly to the urgent desirability of an extension of the area planted to sugar cane.

10. Soil and weather conditions in the colony make sugar the most satisfactory substitute for cocoa from an agricultural standpoint, and the high labour requirement for cultivation, reaping, and factory work give a special value to this crop as a means of meeting the needs of the labouring classes.

COCOA.

11. In 1934 the cocoa crop was approximately 27,000,000 lb. ; in 1935 it rose to 44,387,836 lb. in 1936 the crop fell to 28,339,195 lb. Unfavourable weather conditions as the result of excessive rains in both years, in November and December in particular, were in a large measure responsible for the heavy reductions in 1934 and 1936 but the incidence of witchbroom, the attacks of thrips, and the general neglect due to the protracted period of low prices were also contributory causes.

12. In the Northern Range, on account of a free draining soil, the rains did little damage and record pickings were obtained on many estates during the latter half of the year. In the south recovery from the 1933 hurricane is progressing satisfactorily and good crops were reaped during the fall of the year. The Manzanilla district also gave good pickings from September to December, but the heavy clay districts of Talparo, Cumuto and Sangre Grande gave poor crops. The Montserrat and Rio Claro districts also suffered, the latter by losing the " follow on " fruit of what promised to be a very good crop.

13. Exports and prices during the years 1927 to 1936 were as follows :—

	Exports.	*Value.*	*Price per fanega* (110 lb.)*
	lb.	£	£ s. d.
1927	51,934,857	1,671,883	3 5 11
1928	58,008,156	1,651,179	2 15 0½
1929	61,888,740	1,446,127	2 5 9½
1930	53,825,120	1,136,056	1 18 11
1931	57,186,512	826,333	1 8 8
1932	41,822,127	579,170	1 8 11
1933	51,311,274	555,907	1 0 11½
1934	26,803,149	349,694	1 6 10
1935	44,387,836	527,212	1 3 11½
1936	28,339,195	487,578	2 2 9½

* Monthly average.

Prices.

14. After six weary years of low prices, there was a sharp upward advance. Prices opened at about £1 7s. 1d. per fanega of 110 lb. in January. By May they had risen to £1 17s. 6d. and in December over £3 2s. 6d. was realized per fanega. Unfortunately, the main crop had been sold by the growers before the substantial increase in value.

15. The better prices as well as the grants under the Cocoa Subsidy Scheme have stimulated renewed cultural activities on the part of proprietors of large and small cocoa holdings; and it is regrettable that unfavourable climatic conditions have not allowed of more than partial advantage being taken of the improved prices.

Witchbroom.

16. Witchbroom disease continues to cause the gravest concern. Cocoa exports are now definitely on a lower level than in former years and a graph of six-year periods, commencing with 1889-1894 shows a steady increase to the six-year period 1919-1924. A rapid decline follows and the only encouraging feature was the crop of the year 1935 which reached approximately 44,000,000 lb. as against 27,000,000 lb. in 1934. The subject of witchbroom is discussed in some detail in connection with Marper Estate (p.), and in the reports of the Mycologist (pp.) and the Agronomist (pp.), Part II.

Thrips.

17. Losses due to thrips attack were severe in many districts. Toco suffered particularly badly on the quartz schist soil, but on the other soil types the attacks were less severe. Sangre Grande and Rio Claro had repeated attacks of thrips, and even on the relatively fertile soils of the Montserrat district cocoa trees were heavily attacked.

The Cocoa Subsidy.

18. As noted in my report of 1935, the Legislative Council, towards the end of that year, approved of a scheme for the payment of free grants to cocoa growers based on one cent per pound of cocoa produced, subject to a maximum grant of five dollars per acre.

19. The objects of the scheme are briefly:

(*a*) To assist cocoa rehabilitation in areas that appear to possess sound potentialities for that crop.

(*b*) To help in the establishment of alternative crops, either interplanted in cocoa or as pure cultivations in substitution for existing cocoa.

20. The scheme became operative as from the 1st January, 1936, and the grants, coming as they did at a time when cocoa was valued locally at £1 7s. 4½d., a fanega (110 lb.), and following five year of depressed prices, gave a much needed stimulus to the renewal of activities on cocoa estates.

21. Increased employment was given to a large number of labourers who would otherwise have been unable to obtain regular work, and towards the close of the year many estates owners were unable to obtain the full complement of labour required.

22. The total amount of subsidy money granted during 1936 amounted to £74,783 10s. 10d. covering nearly 8,000 cocoa properties.

23. In making applications for a grant, owners of estates having more than 50 acres under cocoa were required to submit to the Board a programme of the improvements it was desired to effect with subsidy funds. Programmes as submitted were carefully examined by the Board and, if necessary, the owner was requested to amend his programme in order to conform with the basic principles governing the grant of subsidy. Inspectors paid periodical visits to properties in receipt of assistance and checked the work.

COCONUTS.

24. Converted into terms of nuts, the exports of coconut products for 1936 amounted to 33,299,565 nuts as compared with 32,339,783 in 1935. There was a decrease in acreage during the year, due, in many instances, to losses from coconut wilt, but this will be more than compensated for in the near future by the large number of supplies, replanted in the hurricane damaged area, which will soon be coming into bearing. Exports of coconuts, copra and coconut oil follow:

	Coconuts.		Copra.		Coconut Oil.		Price of Copra.
	Exports.	Value.	Exports.	Value.	Exports.	Value.	
	Nuts.	£	lb.	£	Gals.	£	100 *lb.*
1927	6,463,765	32,298	12,498,983	146,895	58,061	11,102	22s.
1928	6,799,655	34,824	21,351,860	227,555	65,285	11,860	20s.
1929	13,608,118	66,320	23,979,882	209,732	34,707	5,403	17s.
1930	5,886,127	25,830	21,891,259	175,965	41,154	5,938	14s.
1931	4,487,875	12,549	19,484,808	101,148	20,702	1,818	8s. 9d.
1932	3,847,245	12,822	15,418,906	91,444	26,461	2,520	10s. 2½d.
1933	7,888,980	21,406	19,357,980	82,945	45,565	3,658	9s. 5½d.
1934	9,850,299	29,128	17,928,775	57,451	31,118	2,244	5s. 10d.
1935	5,376,290	14,393	8,764,646	34,682	14,879	1,339	8s. 6½d.
1936	4,560,180	14,529	9,438,240	51,798	9,437	1,343	11s. 5½d.

Bonus to Copra Producers.

25. Under the terms of the agreement between Government and the Oil Factories, the bonus to copra producers ceases when the price reaches 12s. 6d. per 100 lb., and, owing to the price level during the year, only £4,943 was distributed in 1936 as compared with £18,107 in 1935.

26. The average local price of copra per 100 lb. was 8s. 9d. and 10s. 2d. in 1931 and 1932. In 1933 it was 9s. 5d. and in 1934 it dropped to 5s. 10d. Estates were being neglected and had it not been for the bonus received the position of the coconut industry would have been extremely difficult.

Coconut Growers' Association.

27. Mainly due to the efforts of the President of the Agricultural Society, a number of coconut growers combined and formed the Coconut Growers' Association. The Association started business on 1st May, 1936, and now controls nearly 50 per cent. of the coconut production in Trinidad and Tobago. At the end of the year the membership totalled 69.

28. The Association has decided to erect a factory with a yearly capacity of 1,500 tons copra for the manufacture of edible oils and by-products. The machinery has been ordered and it is hoped to begin manufacturing towards the middle of 1937.

Coconut Wilt.

29. As anticipated, Coconut Wilt continues to take an annual toll of the palms growing in many areas other than free-draining sandy coastal belts. Reference has been made from year to year to the conditions under which wilt occurs. A report by Mr. F. M. Bain, Agricultural Officer, on his work for the year in connection with the investigation of this trouble will be found in Part II.

LIMES AND LIME PRODUCTS.

30. The lime industry continues to be dependent mainly on the exports of lime oil. A mild interest was shown by the world market in concentrated lime juice but the exports from this colony were negligible. Trinidad exporters continue their attempt to establish a trade in green limes and 1,391 barrels were exported compared with 565 in 1935, but the progress in developing this trade has been disappointingly slow.

31. The Trinidad-St. Lucia organization which was inaugurated at a critical moment when world prices for lime oil threatened to collapse, has had a satisfactory year . The neighbouring islands still continue to hold aloof and to sell independently.

32. A sliding scale system of purchase of yellow limes was agreed upon by the distillers, but, with a few exceptions, was not patronized by producers.

33. T.1 limes have not met with success as green limes owing to the narrow margin between the development of juice and the yellowing stage, and the Department is discouraging the growth of this hybrid.

Exports of Limes and Lime Products.

Lime Oil.

	Exports.	*Value.*
	Gals.	£
1927	104	1,454
1928	495	5,894
1929	797	9,516
1930	1,647	19,457
1931	2,413	32,071
1932	929	12,840
1933	1,889	22,575
1934	2,882	25,055
1935	1,949	15,497
1936 —Distilled	22,016 lb.	17,702
—Handpressed	779 lb.	1,430

Lime Juice.

	Concentrated Juice.		Raw Juice.	
	Exports.	Value.	Exports.	Value.
	Gals.	£	Gals.	£
1927	4,488	1,154	Nil.	Nil.
1928	5,653	1,487	Nil.	Nil.
1929	55,455	11,562	Nil.	Nil.
1930	21,762	3,759	47,554	4,096
1931	4,012	458	22,931	2,007
1932	8,583	427	46,629	4,250
1933	11,709	622	17,375	1,203
1934	9,110	535	3,479	294
1935	4,422	393	11,807	806
1936	3,521	321	66,881	4,758

Green Limes.

	Barrels.
1932	189
1933	2,101½
1934	1,439
1935	565
1936	1,391

GRAPEFRUIT.

Acreage.

34. A census made at the end of the year showed that the area under grapefruit is approximately 2,800 acres, of which 2,600 are of the Marsh Seedless variety.

Exports.

	Exports. Boxes.	*Value. £*
1927	1,649	1,427
1928	23	45
1929	807	606
1930	2,184	910
1931	4,377	1,874
1932	10,973	8,978
1933	3,433	2,586
1934	23,518	18,634
1935	51,119	42,473
loose fruit	7,724	
1936	42,958	41,357

35. Producers obtained satisfactory prices and the Directors of the Co-operative Citrus Growers Association are to be congratulated on their foresight in marketing as much of the fruit as possible at times when the English market was not glutted from other sources. As usual, the Trinidad fruit received a premium because of its excellent quality.

36. An effort was made during the year to put our house in order by elimination of seeded fruit in the grapefruit exported as the market shows a marked preference and pays higher prices for seedless strains as compared with seeded types. The matter was first publicly discussed at a meeting of the Agricultural Society and then at a meeting of the Citrus Growers' Association. Arrangements were made by the Association to start a careful survey of the orchards in the island, in co-operation with the Department of Agriculture, and for a series of cross fertilisation tests by Mr. Nigel Wright of the Imperial College of Tropical Agriculture. Proposals for the enactment of legislation to control private nurseries were submitted to Government, and are under consideration.

37. Canning was carried out on a commercial scale for the first time by the Association, and the year's production amounted to 5,000 cases of juice and ' hearts ' ; the canned juice was well received by the Canadian market and the ' hearts ' by the English market.

COFFEE.

38. Exports of coffee in 1936 were a little in excess of the figure for 1935, and somewhat less in value. Towards the end of 1936 there was a welcome upward trend in prices.

	Exports. lb.	*Value. £*
1927	164,072	7,246
1928	265,410	10,883
1929	817,983	32,309
1930	491,988	12,525
1931	857,920	16,276
1932	908,492	20,822
1933	339,196	7,416
1934	525,115	10,595
1935	1,187,867	18,290
1936	1,213,184	17,702

TONKA BEANS.

39. Tonka bean exports showed a large increase over the previous year. Plantings of this crop continue on a fair scale.

	Exports. lb.	*Value. £*
1927	10,015	1,669
1928	884	147
1929	15,266	2,544
1930	9,219	1,538
1931	22,950	3,583
1932	69,276	12,993
1933	9,979	3,004
1934	45,450	14,822
1935	37,968	12,320
1936	92,719	31,002

BANANAS.

40. Regular fortnightly shipments of bananas were continued under the agreement with the Canadian Banana Company and a total of 159,085 bunches valued at £14,797 were exported compared with 66,369 bunches valued at £6,175 in 1935.

41. It was never expected that bananas were likely to prove more than a useful auxiliary crop. This was clearly stated by the Department in the early stages of this new venture. The danger of Panama disease was then well in mind ; on Panama disease has now been superimposed the Sigitoka leaf spot disease that is giving evidence of being more serious than Panama disease, although it was not recorded as being present in the Western Hemisphere until 1933.

42. Bananas can, however, still play a useful part in Trinidad especially on estates where other crops are being substituted for cocoa. To get the most out of this crop, it should be planted on soil of reasonable fertility and, preferably, on soil with an alkaline reaction. Care and attention must be given to the plants and the removal of suckers is imperative. Keen attention to sanitation is necessary and it is regrettable that very little use is being made of the B. D. K. Oil although arrangements have been made for its storage at different centres, and for free distribution to peasant proprietors.

43. During the year, there was a marked reduction in the number of bananas that had to be rejected at the wharf.

44. Negotiations had been entered into with the Canadian Banana Company for an increase in the price paid for bananas.

II. DEPARTMENTAL INSTITUTIONS, DISTRICT WORK, AND OTHER ACTIVITIES.

DEPARTMENTAL INSTITUTIONS.

River Estate.

45. A progressive policy of development has been instituted at River Estate and subsidiary crops—citrus, tonka beans and coffee—play an increasingly important role in the economy of the plantation.

46. The report of the Manager, Mr. R. O'Connor, will be found in Part II of this report. The total revenue for the year amounted to £3,889 7s. 6d., which is the highest sum realised since 1929. Of this amount, the sum of £1,109 15s. 10d., was obtained from sources other than cocoa. The increase in revenue was due to better cocoa prices obtained during the latter half of the year and to the steadily increasing production of crops subsidiary to cocoa.

47. The cocoa crop for the year amounted to 1,021 bags or 211 bags less than in 1935. This yield, which represents 2·63 bags per acre, must be considered satisfactory when compared with the general reduction in the Island's crop during the same period.

48. Witchbroom disease continues to increase in intensity and during the year 57,762 brooms were removed and buried. The comparative figures for the two previous years are 5,287 and 875. The infection of mature pods was not serious.

49. The tonka bean crop is receiving increasing attention, and work on the vegetative propagation of this crop has been continued. It is noteworthy that one young layered plant is now bearing a third consecutive crop though only a little over four years old.

50. The young field of seedlings tonka beans west of the main field, approximately 15 months old at the end of the year, has made remarkable progress. The average height of these seedlings at the age of one year was between three and four feet. Five per cent. of the trees came into flower, and flowers were removed from all but two trees which are holding six to eight fruit each. The seedlings were carefully planted in well prepared holes, adequately surrounded by ground shade and heavily mulched with pen manure at the age of three months, demonstrating the benefits to be derived from proper attention during the early stages of the plants' life.

51. A small plot of budded avocado pears comprising those types which, in cold storage trials have been shown to be suitable for export, has been established.

52. The grapefruit blocked yielded 2,025 boxes, while 313 cases of oranges were produced. The lime crop was a record one of 1,581 barrels compared with 901 barrels in 1935. This increase in yield has been largely due to fertilisers applied during 1934 and 1935, and to improved cultivation.

Reduction of Area under Cocoa.

53. As a result of a survey made of existing cocoa areas it is the intention gradually to replace some 120 acres of poor bearing cocoa with alternative crops. The replacement is being carried out in two ways :—

(*a*) Replacing poor cocoa trees by interplanting with other crops, such as, coffee, tonka beans and limes.

(*b*) Complete removal of existing cocoa and replacement by alternative crops.

The remainder of the area at present in cocoa yields on the average more than three bags per acre.

Experimeutal Work.

54. Full details of the various cultural and fertiliser experiments now established at River Estate, together with an account of the results so far achieved, will be found in the report of the Agronomist. Brief notes relating to the experiments are given below.

Cocoa.

55. *Distance Planting.*—The plots planted at 16 and 18 feet apart, although at first yielding less than plots planted 12 and 14 feet apart, have now, after nineteen years, practically overtaken them and the differences between the yields of trees spaced from 12 to 18 feet apart are now not significant. The closer planting distances 6′ x 6′, 8′ x 8′ and 10′ x 10′ have yielded their eleventh crop ; compared with the eleventh crop for the wider spacings the yield is slightly less and the trees, especially those planted 6 feet apart have grown tall and spindly. Half of the 6′ x 6′ plot has been rogued of all puny trees leaving some 40 per cent. of the originals.

56. *Seedling Progeny of Tree* 4927.—This field was planted with seedling progeny from tree No. 4927 to test whether the seedling progeny from a heavy bearing tree inherited the bearing capacity of the parent. From the 15th to the 20th year after planting the yield has averaged 783 lb. cured beans per acre which is well above the average for the estate (434 lb. per acre).

57. *Budded Plants versus Seedlings.*—Vegetatively propagated plants grown with shade continue to yield larger crops than seedlings from the same trees but without immortel shade the reverse is the case. The differences are slight and not statistically significant.

58. *Colour of Pods.*—The budded trees have again yielded higher crops than the seedling trees, the outstanding yield coming from trees budded from a dark red pod plant. In 1935 this set yielded at the rate of 22 bags per 1,000 (12′ x 12′) and in 1936 the yield was approximately 20 bags per 1,000. When " red " and " yellow " are grown in competition, *i.e.*, in the same picket or budded on the same stock, the " red " continues to predominate in most cases. From this it is suggested that the " red " type is hardier and more vigorous than the " yellow ".

59. *Seedling Trials.*—Field 19 was planted in 1933 as a variety trial of the progeny of six selected high yielding trees. During the year a few pods were borne by some 5 per cent. of the trees and the majority of the trees have grown well in spite of the continued attacks of cocoa beetles and, during 1936, of an unusually heavy attack of thrips.

60. The soil on this field, according to accepted standards is markedly deficient to Phosphate and Potash ; in 1936 a fertiliser experiment was superimposed on the variety trial to study the effects of making up soil deficiencies while trees are still young.

61. The problem of replacing cocoa trees in Trinidad is by no means a simple one as this experiment has shown. Continual watch has to be kept for cocoa beetles and other pests and it cannot be too strongly emphasised that without careful planting, adequate ground shade and constant attention, it is difficult to raise vigorous sturdy plants.

62. *Manurial Experiments.*—During the year a considerable number of new fertiliser experiments have been started. These are to compare organic with inorganic fertilisers, to assess the value of inorganic fertilisers with and without additional organic material and lime and to determine optimum quantities of Potash since the soil on River Estate is outstandingly deficient in this element.

63. Experiments already in progress have again shown that Potash is the most important fertiliser needed on the River Estate type of soil. In the absence of shade trees Nitrogen is slightly beneficial, but under normal shade, it appears on the whole to be detrimental. Phosphate following Potash gives additional benefit and both of these manures are much more efficient in the presence of added organic matter.

64. *Trenching.*—During the year Professor F. Hardy, of the Imperial College of Tropical Agriculture, undertook the analyses of soils from trenches of ages varying from six months to six years. Trenches which had been filled with organic matter six years ago still showed signs of higher fertility than the surrounding soil. This method of adding humus to sandy soils deficient in organic matter is being studied in more detail for it is a problem which is becoming of increasing importance.

65. The method of burying organic matter in trenches 15 inches wide and one foot deep is being compared with spreading the same amount of organic material over the surface of the soil as a mulch and slightly covering it with soil from the drains.

Tonka Beans.

66. Experiments have been laid down on mature tonka bean trees to improve their bearing capacity by the application of artificial fertilisers and pen manure. In addition progeny plots have been planted with layered plants and seedlings from the six heaviest bearing trees and six apparently dwarf trees.

Marper Estate.

67. A close study of the incidence of witchbroom was continued at Marper Estate where 96 acres of cocoa are under cultivation. Brooms were removed and destroyed every alternate month. In 1936 the number of brooms removed amounted to the large figure of 448,500 which is approximately three times as many as in the previous year.

68. The actual cost of controlling witchbroom at Marper during 1936 amounted to £1 2s. 6d. per acre including supervision and the keeping of records of individual trees in the experimental section. This cost represents an increase of 5s. 10d. per acre over the cost of similar work performed in the preceding year. The cost is, of course, higher than would have been necessary on an ordinary estate similarly situated owing to the experimental nature of the work. As will be observed from the figures given below, the measures adopted have succeeded in maintaining yields on a fair level and the incidence of mature pod infection has not been high. In contrast, many privately owned estates in the neighbourhood, where control measures have been neglected, have suffered from considerably reduced yields and from a high percentage of pod infection.

69. The total crop in bags of 165 lb. for the period during which the estate has been owned by Government is as follows :

Year ...	...	**1930.**	**1931.**	**1932.**	**1933.**	**1934.**	**1935.**	**1936.**
Bags ...	...	251	196	211	202	204	292	217

70. The percentage loss of matured pods, as a result of witchbroom, during the period 1932-1936 is given below.

Year.	*Per cent Witchbroom Pods.*
1932	**0.87**
1933	**1.25**
1934	**1.33**
1935	**1.31**
1936	**3.84**

71. On observation plots on other estates where efforts at control have been of an indifferent character owing to lack of funds more than 50 per cent. of the pods were affected during the period September to December, 1936, while Marper maintained an average below 4 per cent. for the same period.

72. Results of the experimental work at Marper will be found in the report of the Agronomist.

St. Augustine Nursery.

73. The number of plants distributed during 1936 amounted to 102,347, an increase of 31,885 over the number issued from the nursery during 1935. Included in the total were 7,612 grapefruit plants and approximately 6,000 budded orange plants; in addition a large number of grapefruit buds were sold.

74. In accordance with the policy adopted in 1935, whereby distribution of seedlings of West Indian limes are restricted to 10,000 annually, approximately 7,000 West Indian lime plants were distributed. There was a reduction in the T.1 limes sold and as this lime has not proved satisfactory for the green lime trade it will not be propagated for general sale.

75. The demand for orange plants has increased and the orders for the Valencia Late variety could not all be filled.

76. Under the Cocoa Subsidy Scheme encouragement is being given to the supplying of vacant spaces in cocoa fields, as well as to the removal and replacement of useless trees, with seedlings raised from high bearing parent trees. In consequence, the raising of cocoa seedlings was undertaken on a larger scale than in previous years and 51,000 were distributed compared with 22,000 in 1935. Towards the close of the year arrangements were put in hand to grow 200,000 seedlings for issue under the 1937 Subsidy.

77. There was an increased demand for avocado plants; the budded variety Pollock being most in demand. The five avocado varieties introduced from America in 1933 have fruited.

78. In the ornamental section seedlings have again been obtained from four varieties of Bougainvillaea but it is too early to judge whether any will prove to be of a desirable type. New introductions of interest include *Cupressus pyramidilis*, an upright growing form; *Cynoglossum*, Chinese Forget-me-not; *Hymenanthera* and *Ficus sycamorus*.

79. The report of the Manager, Mr, F. C. Buthn, will be found in the second part of this report.

The Experiment Station, St Augustine.

80. The principal work undertaken at the St. Augustine Station is experimental work on citrus—grapefruit, oranges, and limes. Attention is also given to minor crops—pigeon peas, cassava, groundnuts, and various types of cover crops. The report of the Manager, Mr. E. J. Gregory, is attached.

81. The citrus experiments, which cover an area of 45 acres, are designed to afford information as to the most satisfactory stocks for grapefruit and orange varieties, to compare the effect of various cultural and manurial treatments and to demonstrate the beneficial effects which result from the maintenance of a proper standard of cultivation and from the regular application of the necessary fertilisers.

82. The experiments were started in 1932 and the plants are only now coming into bearing. A number of valuable indications have, however, been obtained from the manurial experiments which show the value of certain fertiliser treatments for young grapefruit on soils such as are found at the Experiment Station. In particular the greatest growth response, as determined by regular growth measurements, has resulted from applications of a complete fertiliser plus pen manure while lack of Potash appears to be the limiting factor in fruit production, for the largest pickings have been obtained from those plots which have received the heaviest application of this fertiliser.

83. The greater portion of the trees in the experimental area are now just over four years old. Except for irregular growth in certain plots of the manurial experiment, the trees have made good growth and have largely recovered from the severe scale insect infestation of the dry season in 1934. The *Tephrosia candida* windbreaks have afforded protection and have been largely responsible for the satisfactory recovery of the trees.

84. Further back-crosses of the West Indian lime with T.1 and other hybrid limes, using the West Indian as both male and female parent, were made in an endeavour to produce a lime which will be immune to wither-tip disease and which will, at the same time, retain all the desirable characteristics of the ordinary West Indian lime of commerce.

Government Stock Farm.

85. The report of the Officer-in-Charge, Captain H. V. M. Meticier, O.B.E., which will be found in Part II, gives a detailed account of the work undertaken at the Farm during the year.

86. In the cattle section there has been no radical change in the programme of breeding work designed to establish a Zebu-Holstein cross suitable to tropical conditions, and combining the hardiness of the Zebu with the productive qualities of the high yielding Holstein. Herds of ½ bred, ¾ bred and 7/8ths bred crosses have been maintained.

87. The Zebu cattle have been divided into three herds for dairy, working and grading purposes with Holstein-Friesian bulls.

88. Grading with Sussex bulls on beef type cows and heifers has been continued and the small Sussex herd has been maintained as in the past.

89. The Department is greatly indebted to Mr. C. W. H. Glossop for his gift of a pure bred Holstein-Friesian bull to the Government Stock Farm from his well known Lund Herd, Doncaster, England.

90. The Water Buffalo is now replacing Zebu cattle as working animals on the large sugar estates. Through the Department, 8 bulls and 7 cows and heifers of the Murrah strain, of which 2 bulls and 2 cows are for the Farm, were ordered from India and were shipped from Calcutta for Trinidad on December 1st.

91. The dairy herd produced 40,520 gallons of milk, some 4,500 gallons more than in 1935. Public Institutions were supplied with 35,234 gallons and the revenue received from the sale of milk was £4,196 9s. 9½d.

92. There were no cases of Paralytic Rabies on the Farm and no cases of Anthrax. Six animals reacted to the tuberculin test and these were destroyed.

93. The stallion "Young Native" was purchased during the year from the British Bloodstock Agency at a landed cost of £425. He was purchased to replace "Daddy" who died in 1935.

94. Other additions to the Farm during the year included two Large Black gilts from England and two Berkshire gilts from Canada; a British Alpine goatling "Didgemere Delmoney" purchased in England by the Officer-in-Charge of the Farm while on leave in 1935; White Leghorn cockerels and pullets from the Black Lake Farm, Egham, Surrey, and Rhode Island Red and Barred Plymouth Rock cockerels and pullets from Canada.

95. Stud animals have been stationed at the Farm, in Port-of-Spain, and at various centres in Trinidad and Tobago, and arrangements were made for the extension in 1937 of this side of the Farm's activities by standing breeding units for service in outlying districts for a period of two months.

96. The Annual Stock Sale, which was held at the Farm early in December, gave indications of a renewed interest in the keeping of livestock. The amount realised was £660 12s. 6d., an increase of £250 over the proceeds of the 1935 Sale. In addition private sale of stock during the year amounted to £427 13s. 1d.

97. Expenditure during 1936 amounted to £6,819 5s. 11½d. and revenue to £6,660 8s. 10½d.

SUGAR CANE INVESTIGATION COMMITTEE.

98. The work of the Sugar Cane Investigation Committee was continued with funds provided by Government and the Sugar Manufacturers, aided by a contribution from the Colonial Development Fund.

99. The report of Mr. P. E. Turner, Sugar Cane Agronomist, which gives details of the cultural and fertiliser investigations in progress will be found in Part II of this report.

100. On the entomological side Mr. A. Pickles, Entomologist, has continued his work on sugar cane pests and his report will be found in the second part of this report.

101. A survey made during the 1936 crop indicated that the large borer, *Castnia licus*, was responsible for less damage than the small moth borer, *Diatraea* spp., the former boring 0·64 per cent. of all cane joints as compared with 2·63 per cent. by *Diatraea*. In consequence, with the aid of a special grant made by the Committee, experimental importations of the Amazon Fly—a parasite of *Diatraea*—were made from British Guiana in an attempt to effect biological control. Breeding and liberation of these introduced parasites are now in active operation and indications at the present time are encouraging for the parasites have been recovered from the fields in which the first liberations were made.

102. Outbreaks of froghopper during 1936 were severe, more especially in the northern areas where the attack was considered the most serious since 1931. Some 1,200 acres of cane were seriously blighted but, in most cases, recovery was remarkably good.

103. Experiments on froghopper control have given indications that pyrethrum dusts and sprays may prove efficacious for the destruction of adult insects, and over 70 per cent. mortality of the adult froghopper population has been obtained with primitive apparatus and under unfavourable conditions. Further attention will be given to this line of investigation during 1937.

104. The relative resistance of the various varieties of cane to froghopper is being investigated by Mr. R. G. Fennah of the Imperial College of Tropical Agriculture.

FERTILISER EXPERIMENTS.

105. The reports of Mr. P. E. Turner, Sugar Agronomist, and Dr. F. J. Pound, Agronomist, indicate the extensive scale on which fertiliser experiments have been carried out during the year. The work with canes was under the Sugar Cane Investigation Committee, and the large number of fertiliser trials on cocoa estates was made possible by a liberal grant of £2,500 from the Cocoa Subsidy Board. Fertiliser experiments with citrus and tonka beans were under the supervision of Mr. E. J. Gregory and Dr. Pound, respectively.

106. Officers of the Department responsible for the cocoa, citrus and tonka bean experiments have kept in close touch with Professor F. Hardy of the Imperial College of Tropical Agriculture and have in a large measure been assisted by the results of his soil survey studies and by his advice.

IRRIGATION.

107. An interesting experiment was carried out at Macqueripe Estate, the property of Mr. Geo. F. Huggins, O.B.E. A report by Mr. F. M. Bain, Agricultural Officer, is published in Part II.

WITCHBROOM DISEASE OF COCOA.

108. Detailed information regarding witchbroom disease is given in various sections of this report and the comments by the Mycologist as well as the information under Marper Estate give an idea of the relative extent to which the disease is affecting crop production on properties where control measures have been regularly carried out and on properties where they have been largely neglected owing to depressed prices.

109. During the past year weather conditions were favourable for the spread of the disease and there was an increase both in intensity and in distribution, and it is regrettable that the disease has now been found in the Toco area. It is noteworthy, however, that although the disease was reported on one property in the Caura Valley some three or four years ago there has been practically no extension in this area. In other districts the development has been so rapid and serious that it appears necessary to abandon cocoa in such localities. The grants under the Cocoa Subsidy Scheme provide for the planting of alternative crops where witchbroom or other conditions point to the improbability of cocoa proving profitable.

110. In the Annual Report of the Department for 1933 an account is given of Mr. Stell's visit to Ecuador to investigate the report of the development in that country of strains of cocoa showing some measure of resistance to witchbroom.

111. With the aid of a contribution from the Colonial Development Fund an expedition will be sent during 1937 to Ecuador and other South American countries for the purpose of obtaining, if possible, planting material from resistant strains already in cultivation, as well as wild types of cocoa from which immunity, or a high degree of resistance may be bred into the present varieties.

LOSS FROM VERMIN.

112. Rats and squirrels have been destroying an increasing proportion of the cocoa crop as a result of the neglect of the past few years. Careful experiments were put in hand by the Entomologist; and field work in the Manzanilla Ward was under the supervision of Mr. B. G. Montserin, Agricultural Officer. Conclusive evidence was obtained of the value of sulphur matches and bananas for poisoning rats, but little success was obtained from any of the poisons set for squirrels.

PARALYTIC RABIES.

113. Paralytic rabies transmitted by bats was the cause of 217 deaths among livestock during the year as compared with 331 cases in 1935. The greatest number of cases, as in former years, was in the Northern Area. Bovines were chiefly affected, although deaths occurred in horses, mules, donkeys and a number of smaller animals. No dogs were affected.

114. Control measures have been in operation throughout the year. These consist of vaccination of livestock and the destruction of bats by shooting and poisoning. Seven thousand five hundred animals were vaccinated and only six deaths occurred in animals so treated. Vaccination is carried out by the Veterinary Division of this Department free of cost for the peasantry, while estate proprietors are charged the cost price of the vaccine.

115. The work of bat destruction has been organized and undertaken by the Medical Department and during the year some 5,000 bats were destroyed.

116. The Government Bacteriologist examined 1,780 bats and found negri bodies in 98. The distribution of the disease in bats was widespread, and the incidence although low was higher than ast year.

117. The measures of control adopted, as judged by results, are proving satisfactory and a continuation and intensification of the present campaign, particularly the work of bat destruction, should result in a reduction in the numbers of deaths of livestock from this disease.

118. Professor F. W. Urich, who has been engaged on studies of the life histories of *Desmodus rufus* and other bats, became seriously ill in August and had to retire from the Service.

119. Acknowledgment is due to Professor Urich for having worked out and initiated, in association with theMedical Department, lines of bat destruction under field conditions, and for having developed a successful technique for keeping bats alive in captivity for long periods of time, which has allowed of valuable research work being carried out by the Government Bacteriologist into the nature of this disease and the part played by the bat as the vector.

DISTRICT AGRICULTURAL WORK.

120. Mr. A. B. Killick, Assistant Director of Agriculture, who is in charge of district work reports as follows.

121. The district staff consists of two Agricultural Officers and eleven Agricultural Advisers supplemented by a number of Inspectors of the Plant Protection Service. Of the advisers two are stationed in Tobago, one is engaged solely on work in connection with the organization and control of agricultural credit societies and a fourth is posted to the principal rice growing district and devotes his attention primarily to the encouragement and development of peasant grown rice in the area under his charge. The other advisers are each stationed in a county and the greater part of their time is devoted to advisory work among peasant proprietors. Close contact is maintained with their work owing to the fact that all advisers attend the Head Office of the Department at the end of each month and, in addition, visits are made to the various advisers in their districts. On such occasions the opportunity is taken of discussing the work on hand and advising as to future activities.

Peasant Proprietors' Cocoa Holdings.

122. During 1936, in order to assist in the administration of the Cocoa Subsidy Scheme Agricultural Advisers and Plant Protection Inspectors were engaged throughout the year, for three days a week, on Subsidy work. Their duties in this connection were primarily to visit the smaller cocoa properties and to report to the Subsidy Board on the standard of work undertaken with the subsidy grant.

123. This special work had the very real advantage of bringing members of the district staff into close contact with a very large number of peasant growers and gave advisers an excellent opportunity for intensive propaganda designed to encourage a higher standard of farming among peasant proprietors. Further, the fact that these visits of inspection were made under the aegis of the Subsidy Scheme lent an additional force to the advice given by the visiting staff, for proprietors were aware that a continuance of the grant was dependent on the receipt, by the Subsidy Board, of favourable reports on the condition of their properties. They were the more ready, therefore, to listen to, and take action on, advice tendered than, perhaps, they would otherwise have been had there been no pecuniary advantage to be gained by putting into effect the advice received.

Bananas.

124. As in 1935, the fortnightly shipments of bananas made under contract with the Canadian Banana Company have demanded close attention to banana work by members of the district staff and by the Banana Officer who is constantly engaged in visiting and advising those interested in this crop. The purchase of bananas from the smaller growers throughout the island is under the general supervision of Mr. J. R. Foster, Chief Inspector under the Plant Protection Ordinance, and actual roadside and railhead purchases are made by advisers and Plant Protection Inspectors, assisted, this year, by a number of the district staff in the employ of the Cocoa Subsidy Board.

125. Apart from the actual purchase, a considerable amount of time has been spent by the district staff in advisory and educational work ; it has been necessary to maintain close touch with the various banana growers in order to effect a very necessary improvement in the grade and condition of the fruit offered for sale. A considerable measure of success attended this work and during the second half of this year there was an improvement in the handling of the fruit, though, on account of careless handling or incorrect grade, it is still necessary to reject at the time of purchase an undue proportion of the fruit offered for sale.

126. The Banana Officer, during the year, gave seventy-one lectures and demonstrations and paid two hundred and forty-six visits to banana properties. In addition arrangements were made to establish small demonstration plots at suitable centres with the object of showing banana growers the value of intensive cultivation. Two such plots were laid down during the year and six more will be established early in 1937.

Rice.

127. In the Oropuche Lagoon area the season was, on the whole, unfavourable. The crop suffered from heavy rains during the time nursery operations were in progress and from abnormally dry weather when the young plants were being transplanted. No accurate estimate of the acreage under rice in the lagoon area could be obtained but it was probable that some 1,800 acres were under cultivation with an average yield of about 11 barrels (150 lb.) of paddy per acre. The hulling of grain by the seesaw method has been superseded by a number of small hulling factories, owned and operated by traders and shopkeepers who make a small charge to the producer for hulling his rice. In this area, practically all lands suited to rice cultivation are planted up annually and extension of production will depend on the introduction of better irrigation and drainage facilities. A number of schemes designed to improve the water supply to rice lands have been under consideration during the past few years but it has not been possible to put any of the proposals into operation owing mainly to the unwillingness of the growers to pay even a small charge for water supplied. In fairness to the growers it should be pointed out, however, that some of the schemes are not irrigation schemes in the true sense of the term. A number depend on the conservation of existing water supplies and the provision of additional water is not, in the circumstances, a practical proposition.

128. In the Caroni area the rice crop was satisfactory and averaged some 20 barrels per acre.

Food Crops other than Rice.

129. In the reports of previous years mention has been made of the fact that the colony falls far short of being self supporting from the food point of view and that large quantities of both meat and vegetable foods, for the growth of which Trinidad is eminently suited, are imported annually. The year 1936 has shown no improvement in this respect. The table below gives details of the imports of six of the principal commodities imported and it will be noted that the total for the year under review has increased by £69,850 over the corresponding figure for 1935. This increase is largely due to the increased purchasing power of consumers and reflects the generally improved conditions which have resulted from the higher prices which, particularly during the second half of 1936, have been obtained for the main agricultural products of the colony.

	1933.	1934.	1935.	1936.
	£	£	£	£
Flour	282,640	288,305	306,089	339,756
Rice	147,855	164,262	172,040	180,092
Condensed Milk	83,317	94,709	98,373	115,819
Meat	72,606	72,372	87,430	87,168
Vegetables (Onions, Irish potatoes, &c.) ...	55,256	56,668	55,019	65,123
Beans and Pulses	34,825	27,591	17,835	20,678
Total	676,499	703,907	736,786	808,636

130. It should not be assumed from the foregoing that the colony relies entirely on imported foods. While it is true that the basis of the diet of the working classes is imported flour or rice, in the aggregate a very large amount of ground provisions are grown and consumed annually by the smaller peasant proprietors. It is the extension of these activities, and the organization of the marketing of produce, surplus to the requirements of the family, which are necessary if the colony is to cease to rely, to the extent which it does at present, on the importation from outside sources of essential foodstuffs.

131. The question of supplying by local production, as far as is practicable, the meat requirements of the colony received careful consideration during the year, in conjunction with the Livestock Sub-Committee of the Agricultural Society, and a report detailing recommendations designed to attain this objective will be forwarded to Government early in 1937.

132. The reasons for the failure by the peasantry to grow adequate quantities of vegetable foods have been given in previous reports. Apart from the fact that the present custom is a legacy of years of high cocoa prices when it was more profitable to concentrate on the growing of an export crop of high value and to rely for food supplies on shop purchases of relatively low priced foodstuffs, there is the ever present fear of praedial larceny which, at the present time, is the principal reason for the failure to extend to a material degree the cultivation of home grown foods.

Land Settlement Schemes.

133. At the end of the year there were 26 Settlements established in Trinidad and one in Tobago. These Settlements are the outcome of a scheme originally devised by the Sub-Intendant of Crown Lands and have as their object the settlement of individuals on small allotments where they can build their houses and on which they can grow ground provisions primarily for household consumption. The allotments are either purchased outright or are leased at a small rental for a period of years, the land being purchased when the tenant has accumulated the necessary capital.

134. In so far as this Department is concerned the work in connection with these settlements consists of the preliminary inspection of the sites selected to ascertain whether they are agriculturally suitable, and it is also one of the duties of the district staff to make periodical visits to established settlements to advise on cultural methods and to stress the need for adequate manuring in order that soil fertility may be maintained.

135. By the end of 1936 two thousand acres had been given out in small allotments at various centres and there were 1,048 allotment holders; in addition two cocoa estates in the Toco district had been taken over from the Agricultural Bank and laid out in 96 allotments all of which were quickly taken up by the peasantry resident in the district.

136. In connection with these two properties the work of Mr. S. E. Hagley, Agricultural Adviser of the Toco district, deserves special mention. This Adviser has thrown himself whole-heartedly into the project and, in collaboration with the Assistant Warden, personally selected suitable tenants from among the numerous applicants for the allotments. The result has been that the land has been given out to tenants who are genuinely interested in agriculture and the future development of these settlements will be watched with particular interest. It is fortunate also that the Adviser's house is situated on one of the properties and he is making the land around his house a focus of agricultural activities and is demonstrating in a most practical manner the advantages of growing the various crops suited to peasant cultivation under the conditions which obtain in that particular area, and the way in which such crops can best be grown.

137. It must be admitted that the district staff, on account of the number of other duties which they have to perform, have not in the past been in a position to give the concentrated attention to these settlements which they should receive and proposals for effecting an improvement in this connection are under consideration.

Government Fermentaries.

Biche.

138. The Fermentary handled 129,885 lb. of wet cocoa during the crop season ending the 30th June. The amount of cocoa brought to the Fermentary was 60,000 lb. less than in 1935 largely due to the short crop. One hundred and twenty-six small proprietors made 661 deliveries and were satisfied with the prices paid. The cured cocoa was sold in the usual way through the Cocoa Planters Association.

Penal.

139. This Fermentary handled but a very small quantity of cocoa, 28,726 lb. Owing to abnormally unfavourable weather during the cropping season the crop in the area served by the Fermentary was of short duration and very poor yields resulted. Further, competition from local produce dealers, who offered prices higher than those paid at the Fermentary, induced sellers to patronise the local shops rather than bring their cocoa to the Fermentary. While the Fermentary, therefore, had little effect on improving the quality of peasant grown cocoa produced in the area, it did bring about an increase in the price growers received for their cocoa which, in certain cases, was as high or higher than the market value in Port-of-Spain.

AGRICULTURAL CREDIT SOCIETIES—TRINIDAD AND TOBAGO.

140. Three agricultural credit societies have been registered during the year, bringing the total to 54—41 in Trinidad and 13 in Tobago.

141. Twenty-two of the 41 societies in Trinidad are financed and controlled by the Ste. Madeleine Sugar Co., Ltd. Of the 19 societies run by the Department, 17 have been in active operation during the year. Loans made to 13 of these societies amounted to £2,367 8s. 1d., and on the whole, with the exception of four societies, repayments have been fairly satisfactory. Their total indebtedness to Government, at the close of the financial year, 30th June, 1936, was £1,088 19s. 2d.

142. No new loans were made to the 13 societies in Tobago owing to the fact that their repayments, with the exception of 3 societies, had been very unsatisfactory. Their total indebtedness to Government at the end of June, 1936, was £1,568 10s. 10d. all of which is long over-due and pressure is being put upon members to liquidate their outstanding liabilities.

Tobago Producers' Co-operative Association, Ltd.

143. This Association has completed its second year of operation and has made fair progress. Its activities consist in making ice, and in handling imported groceries and organizing the export of agricultural products such as cocoa, copra, coconuts, ground provisions, plantains, fruit, green vegetables, peas, corn, tobacco, meat and fish. The handling of food crops in Port-of-Spain, shipped by the Association, is in the hands of the Ground Provision Depot.

Tobago Lime Growers' Co-operative Association, Ltd.

144. The limes handled by the factory amounted to 4,080 barrels as compared with 4,221 barrels for the previous year, the decrease being due to competitive buying by hucksters from Trinidad.

145. The Association has become a member of the West Indian Lime Oil Sales Company.

Tobago Co-operative Cocoa Fermentaries.

146. There are five Co-operative Cocoa Fermentaries in Tobago. The crop handled by the Pembroke, Roxborough, Delaford and Parlatuvier Fermentaries during the 1935-36 season was 1,447 fanegas (110 lb.) as compared with 1,674 fanegas for the previous year, the decrease of 317 fanegas being due to a poor crop year. The Fermentary run by the Tobago Producers' Association handled 162 fanegas during its first year of operation. Roxborough and Pembroke Fermentaries show good promise, but the results of the Delaford and Parlatuvier Fermentaries are unsatisfactory.

Co-operative Citrus Growers' Association, Ltd., of Trinidad and Tobago.

147. Due to weather conditions the citrus crop during 1936 was less than that obtained in 1935. In the 1935-36 season the Association shipped 40,954 crates of grapefruit and 2,329 crates of oranges, making a total of 43,283 crates, as compared with 48,933 crates of grapefruit and 3,588 crates of oranges, or a total of 52,521 crates for the preceding year. The disposal, by the Association, of cull fruit at a profit has been made possible by the installation of a canning plant. The membership comprises practically all persons owning grapefruit cultivations in the colony.

The Coconut Growers' Association, Ltd., Trinidad and Tobago.

148. This is a new Association registered in February, 1936, and its main object is to obtain, by direct marketing, the best prices for its members who at the end of the year numbered 69. The Association commenced business on the 1st May and at the close of the year had handled 2¾ million nuts and 2,074 tons of copra on behalf of its members.

Plant Protection Service.

149. A small staff of three inspectors is permanently employed in connection with Mosaic disease of sugar cane. Their duties are to visit lands on which farmers' canes are being grown and to mark infected plants which are subsequently destroyed by the farmer. During 1936, 1,775 farmers representing an area of 4,564 acres were visited and 3,423 infected stools dug out ; in 1935, 1,379 acres were inspected and 2,374 stools destroyed.

150. A fairly extensive campaign was instituted in September against cocoa rats which are the cause of considerable crop losses. Details of the method used and of the results achieved will be found in the report of the Entomologist.

151. Black bees, a destructive pest of citrus plants, were not very prevalent during the year and only 30 nests were destroyed. During 1936, 124 plant protection orders were issued.

152. Panama disease of bananas is still on the increase but both large proprietors and peasants are very reluctant to treat diseased stools. Supplies of Banana Disease Killer Oil are kept at convenient centres for free issue to peasant proprietors and it is regrettable that very few make use of this service. One thousand one hundred and thirty-four stools of Gros Michel bananas were treated by Plant Protection Inspectors.

Miscellaneous.

153. Agricultural Advisers have undertaken the inspection of properties mortgaged to the Agricultural Bank, the preliminary judging of school gardens, and valuations for the Public Works Department to assess compensation payable in respect of cultivations taken over for road construction purposes.

154. Seed of two selections of pigeon peas and cuttings of a new variety of sweet potato were distributed to interested growers. Encouragement has been given to the establishment of cauliflower growing among market gardeners in the Diego Martin and San Juan areas.

155. In the Oropuche Lagoon area the adviser has had some success in stimulating an interest in the cultivation of tomatoes for export, and small shipments were made to Canada, with satisfactory results, during the early months of the year.

COMMITTEE WORK.

156. Both the Director and the Assistant Director were involved in much Committee and Board work during the year. The Committees of which one or other of these officers were member or Chairman were : Board of Agriculture ; Committee of Management of the Agricultural Society, and the Livestock, Cocoa and Exhibition Sub-Committees of the Society ; Cocoa Subsidy Board ; Hurricane Relief and Cocoa Industry Relief Committees ; Sugar Cane Investigation Committee ; Banana Board ; Plant Quarantine Committee ; Managing Committee of the Ground Provision Depot ; the Nutrition Committee ; Board of Management of the Co-operative Citrus Growers' Association ; and the Civil Service Staff Board.

IMPERIAL COLLEGE OF TROPICAL AGRICULTURE.

157. Close relations have been maintained between the staff of the Imperial College of Tropical Agriculture and the staff of the Department of Agriculture. Two of our officers—the Sugar Cane Agronomist and the Entomologist—are allowed laboratory facilities at the College and this arrangement works very satisfactorily. A rapid field survey of the soils in the Rio Claro-Princes Town area was undertaken during the year by officers of the College and the Department and valuable data was collected (*vide* the report of the Agronomist). Towards the end of the year a joint study of conditions affecting the growth of cocoa in the Toco district was started. I have to express my gratitude to the Principal, Sir Geoffrey Evans, and to the members of his staff for their readiness to collaborate with the Department in work designed to benefit the agriculturists of the Colony.

PUBLICATIONS.

158. The following publications, or contributions to literature, by officers of the Department were issued during the year :

" Field Experiments on Sugar Cane in Trinidad " Annual Report for 1936—Mr. P. E. Turner.

" Results of Manurial Experiments on Cocoa at Marper " Tropical Agriculture, Vol. XIII. No. 9, pp. 233-241.

" The Completion of Selection, 1935 "
" Studies of Fruitfulness in Cacao " VIII
do. do. IX
do. do. X
} 5th Annual Report Cacao Research.

III. REVENUE AND EXPENDITURE.

159. Annexure " A " contains a detailed statement of the accounts of the Department for the year 1936. The total expenditure amounted to £44,948 15s. 0d. and was £1,063 6s. 8d. more than in the previous year. The total revenue was £15,837 10s. 0d. and was £2,500 16s. 8d. more than in 1935. The Stock Farm brought in £6,660 8s. 4d., River Estate £3,889 11s. 8d. the St. Augustine Nursery and Experimental Station £1,928 6s. 8d. and Veterinary Fees £1,900 12s. 6d.

160. The work under the Plant Protection Ordinance was responsible for the sum of £3,932 10s. 0d. Upkeep of the Royal Botanic Gardens, the Queen's Park Savannah and other Government Grounds cost £2,629 3s. 4d., and £310 was a contribution to the work of the Sugar Cane Investigation Committee.

IV. STAFF.

161. The following new appointments were made during the year :—Mr. A. B. Killick, B.Sc., Assistant Director ; Mr. R. E. Dean, Curator, Royal Botanic Gardens ; Dr. E. N. Chenery, Ph.D. Chemist-Field Assistant (attached to the Imperial College of Tropical Agriculture) ; Dr. T. A. des Iles, B.V.Sc., Veterinary Surgeon, Tobago ; and Mr. E. V. Stewart, 4th Clerk (Acting).

162. Mr. E. A. Thomas, 4th Class Clerk, was absent from the colony on vacation and sick leave from 1st March to 20th October, 1936, when he retired after 16 years of faithful service.

163. I desire to acknowledge my indebtedness to the members of the staff for their keen interest in, and their close application to, their duties.

(Signed) E. J. WORTLEY,
Director of Agriculture.

25th March, 1937.

PART II.

DIVISIONAL REPORTS.

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REPORT OF AGRONOMIST FOR 1936.

The annual report for 1936 deals with :

A.—River Estate and experiments in progress there.

B.—Marper Estate and experiments in progress there.

C.—Experiments on cocoa on non-departmental estates.

D.—Experiments with Tonka Beans.

E.—Notes on :—

1. Grenada cocoa experiments.
2. Root studies in cocoa.
3. Experiments on other crops.
4. A soil and agricultural survey of the Rio Claro-Princes Town area.

F.—Summary of conclusions.

General.

2. The outstanding feature of the year's work has been the complete overhaul of all existing fertiliser and cultural experiments, many of which had fulfilled the purpose for which they were laid down and had outlived their usefulness. Results, tendencies and indications of beneficial treatments which they gave have been made the problems of new and more precise experiments. Nine well planned fertiliser experiments were taken over as going concerns from the Cocoa Research Department of the Imperial College of Tropical Agriculture. These and 26 new latin square type experiments form the nucleus of cocoa experiments to date, on the important soil types of the colony. In addition nearly 200 small demonstration experiments have been laid down on numerous cocoa estates of the colony. Each consists of two or more acre blocks, one of which, taken at random, is left for control while the others are given various fertiliser or fertiliser and cultural treatments. The object of these experiments is threefold :—

(1) To demonstrate and extend the results gained from earlier latin square experiments.
(2) To give indications for new latin square experiments.
(3) To teach cocoa proprietors the value of using fertilisers.

3. Several preliminary experiments have been laid down on Tonka Beans which have recently risen rapidly in importance as a profitable crop. These will be discussed in some detail in the Tonka Bean section of this report.

A.—River Estate and Experiments in progress there.

4. During the year under review considerable changes have been made at River Estate. A policy has been developed that every field is to answer some problem which should be of interest to planters of this colony and possibly of other colonies also. The result will be that costs of production may increase since experimental plots need extra supervision and careful reaping. Then there is the fact that suggestions which are being tried out may not all be beneficial. It should be realised that experiments which are to save planters unnecessary expense must of necessity themselves be expensive with the close supervision and careful handling which they require. It must be realised that the function of an experiment station is not to compete with local estates in the cheap production of produce but to bear the expense of carrying out experiments which may demonstrate :—

(1) New treatments which would be beneficial to adopt.
(2) Existing treatments which are not economic, and thereby save money over the colony as a whole.

5. At the close of 1935 the cocoa area was critically surveyed jointly by the Manager and Agronomist with the result that some 120 acres of mediocre cocoa were marked for replacement. The effect of this is that only the good yielding fields will remain in cocoa and consequently on the reduced area much more intensive work will be possible. Each field that is to be left in cocoa has already had some particular experiment allotted to it.

6. The areas holding mediocre cocoa have been allocated in various ways for conversion to other crops upon which experiments can be made. This in itself is being done along experimental lines—by gradual or total replacement—since the efficient conversion of similar portions of other estates to coffee, tonka beans and citrus is one of the main problems confronting Trinidad planters to-day.

7. Much of this work has been made possible by the Subsidy Grant which was spent in performing for the benefit of visiting planters one example of each of the operations suggested by the Subsidy Board. Details of this work have been reported by the Manager but it is here pertinent to observe that of the two fields in which cocoa was rehabilitated, one with fertiliser application and one without, the former recovered more quickly, cropped earlier and heavier. This checks up other observations that heavy pruning and cutting of cocoa trees answers better on highly fertile soils than on infertile soils and probably explains the erratic cropping which has followed this operation in different parts of the colony.

Field 19.

8. This field deserves special mention for in it 12 acres of cocoa have been replaced by seedlings from the six most desirable trees at River Estate, in the form of a variety trial. These trees now average three years old. A fertilizer experiment was superimposed on the variety trial during 1936 and during 1938 a cultivation experiment will also be added. The south-east end of the field was very badly attacked by thrips in October-November and suffered some set back but since spraying with Bordeaux Mixture the trees have improved again.

9. Several trees have borne fruit. In the same field one acre of grafted pure Criollo trees is being planted, 100 of which are already in place. This acre of Criollo trees is the second of several being planted in the colony to test the possibility of growing grafted Criollo cocoa under Trinidad conditions. The first acre was planted on Chocolate soil in the Central Range.

Field 7.

10. This field is being prepared for planting a propagation trial experiment by the Cocoa Research Department of the Imperial College of Tropical Agriculture, using 100 specially selected trees from estates of the colony.

Fertiliser Experiments on Cocoa at River Estate.

11. A list of the fertiliser experiments in progress at River Estate is appended. Those marked with an asterisk were laid down during the year and have shown no results of value yet since they have not passed one complete crop season. Notes on the results obtained to date on the others are given below the tables. These early experiments were inaugurated by the Cocoa Research Department of the Imperial College and were taken over by the Agronomist in January, 1936.

List of Experiments.

Code No.

A—1 Nitrogen, Potash and Phosphate trial on Field 8. Residual effect.

A—8 *Optimum dressing of Potash—interaction with Lime. Field 20.

A—9 *Optimum dressing of Potash—interaction with Phosphates. Field 20.

A—10 *Optimum dressing of Potash—on recently trenched field. Field 22.

A—11 Nitrogen, Potash and Phosphates without shade. Field 20B.

A—12 Nitrogen, Potash and Phosphates with shade. Field 21.

A—13 Mulch *v.* fertiliser trial. Field 25.

A—14 Comparison of different varieties of Phosphates and Potassic manures. Field 9A.

A—18 *Relative values of Potash and Phosphate after trenching. Field 23.

A—19 *Pen manure as mulch *v.* trenching. Interaction with forking. Field 8.

A—20 *Organic *v.* inorganic fertilisers. Interaction with Lime. Field 9B.

— Standard fertiliser to whole field—previous record known—no special treatments. Fields 6, 8, 9, 12, 13 and 16.

— Standard fertiliser to budded clones. Field 25.

A—42 *Potash *v.* Phosphate on 3-year old variety trial.

— Mulch bedding with and without fertilisers. Field 10.

YIELD DATA FROM SOME RIVER ESTATE EXPERIMENTS—EXPERIMENT CODE No. A 1.

Yields of Pods from N.P.K. Trial.

Treatment.	Natural Yields 1931-32	1933-34 Increase on nat. Yields.	1934-35 Increase on nat. Yields.	1935-36 Increase on nat. Yields.	Total.	Average % Increase	Effect of Fertilisers.
Control	1,016	— 96	— 94	—337	—527	—17·32	—
Sulphate of Ammonia	1,160	—336	+ 9	—577	—904	—26·00	—
Superphosphate	952	— 85	—112	—282	—479	—16·8	—
Sulphate of Potash	912	+ 24	+470	+107	+601	+21·90	+47.5%
Nitrogen+Phosphate	856	—184	—205	—332	—721	—28·0	—
Nitrogen+Potash	1,136	—112	+ 62	—288	—338	—10·0	—
Potash+Phosphate...	1,168	+176	+605	+114	+895	+25·5	+51.8%
N.P.K.	984	+128	+418	+ 93	+639	+21·6	+47.0%

EXPERIMENT CODE No. A 11.

Yield of Wet Cacao from N.P.K. Trial (No Shade).

Treatment.	Natural Yield 1934	1935 1st year increase.	1936 2nd year increase.	Average.	Per cent. Increase.
Control	245	131	150	141	58
N	236	232	204	218	92
P	175	158	174	166	95
K	221	248	185	217	98
N.P.	218	154	149	152	70
N.K.	200	279	271	275	138
P.K.	194	276	265	271	139
N.P.K.	225	257	238	248	110
N.P.2K	232	367	323	345	149

EXPERIMENT CODE No. A 12.

Yield of Wet Cocoa from N.P.K. Trial (lb.).

Treatment.	Natural Yield 1934.	1935 1st year increase.	1936 2nd year increase.	Average	Per cent. Increase.
Control	213	223	141	182	85
N	201	270	138	204	102
P	195	306	185	246	126
K	130	375	267	321	247
N.P.	163	393	307	350	215
N.K.	167	363	238	301	180
P.K.	180	436	285	361	200
N.P.K.	204	430	259	345	172
N.P.2K.	202	521	304	413	206

EXPERIMENT CODE No. A 13.

Table of Increases Due to Treatments (Pods).

Treatments.	Control.	Mulch.	Potash.	Mulch and Potash	Totals.
Control	—143	—160	— 4	+225	+ 18
Sulph. of Ammonia ...	—112	+ 14	—147	+156	— 89
Superphosphate ...	+ 70	+214	+369	+312	+965
Super and Ammonia ...	— 40	+186	+107	+169	+422
Totals ...	—225	+254	+325	+862	

EFFECT OF MULCH ON EFFICIENCY OF POTASH AND PHOSPHATE (ALL PLOTS).

	Without Mulch.	With Mulch.	Value of Mulch.
Potash	+325	+862	+537
Phosphate	+506	+881	+375

EFFECT OF SULPHATE OF AMMONIA.

	Without Sulphate of Ammonia.	With Sulphate of Ammonia.	Value of Sulphate of Ammonia.
All Plots	+883	+333	+550

Experiment Code No. A 14.

COMPARISON OF PHOSPHATE AND POTASH FERTILISERS—1936.

Treatment.		Yield lb. wet cacao.		Increase over Control.
2·64 lb. Super per tree	+Sulph. of Potash ...	485	1,000	34·2 per cent.
	+Muriate of Potash...	515		
1·13 lb. Sulph. of Ammonia per tree ...	+Sulph. of Potash ...	404	812	9·0 per cent.
	+Muriate of Potash...	408		
1·5 lb. Nicifos C	+Sulph. of Potash ...	408	832	11·7 per cent.
	+Muriate of Potash...	424		
2·64 lb. Super plus 1·13 lb. Sulph of Ammonia	+Sulph. of Potash ...	445	872	17·0 per cent.
	+Muriate of Potash...	427		
Control	+Sulph. of Potash ...	399	745	—
	+Muriate of Potash...	346		

Total Sulphate of Potash —2,141 lb.
Total Muriate of Potash —2,120 lb.

Experiments A 1, 11, 12, 13 *and* 14.

12. These experiments have shown :

(i) That Sulphate of Ammonia whether applied alone or with other manures has usually caused diminished yields.

(ii) Potassic manures are extremely beneficial and Muriate proved to be as effective as the more expensive Sulphate (Muriate does not store well).

(iii) Phosphatic manures are somewhat beneficial alone but they greatly enhance the value of Potassic manures.

(iv) Organic matter alone may not be very valuable but applied with Potash and Phosphates it greatly enhances the value obtained from these two. These three are complimentary.

(v) Cocoa grown under partial shade (normal for River Estate) gave better responses to manuring than cocoa grown under no shade conditions. In the latter but not the former, nitrogen was beneficial which probably explains the benefits derived from Ammonium Phosphate (Ammophos) in Grenada under no shade conditions.

Cultural Experiments on Cocoa at River Estate.

1.—*Distance Spacing Experiments.*

13. The details of these experiments have been presented in earlier reports and do not need repetition here.

14. Statistics of yields to August 31st, 1936, are given below :—

Spacing Experiment :

Spacing	*Average 1st 11 years.*	*Yield 11th Crop.* 1936.	1928.
	lb.	lb.	lb.
6×6	352	341	
8×8	317	389	
*10×10	169	223	
12×12	354		498
14×14	343		550
16×16	268		494
18×18	238		486

*Happened to strike a poor soil pocket.

	Average 19 Years.	*Yield 19th Crop.* 1936.
	lb.	lb.
12×12	452	258
14×14	460	437
16×16	408	387
18×18	392	406

There are probably no significant differences between these yields.

2.—*Seedlings from Heavy Bearing Tree No. 4927.*

15. The average yield for this tree during the four years 1913-1916 was 332 pods per annum roughly equivalent to half a ton of cocoa per acre per annum since it occupied a space of 30×30 ft. and gave pods valued at 16 to the pound. In 1917 a plot of 178 stakes was planted with seed from this tree. The yield of the progeny since 1926 is given below :—

YIELD OF PROGENY OF TREE 4927 (lb. per acre).

1926.	1927.	1928.	1929.	1930.	1931.	1932.	1933.	1934.	1935.	1936.
286	637	818	816	710	634	821	748	745	963	638

Thus the progeny although only just mature have given yields well above normal for the estate (approximately 450 lb. per acre).

3.—*Propagation Experiment.*

16. The object of this experiment is to test the comparative merits of seedlings, budded and grafted trees of the same parents under estate conditions. Full particulars of the experiment and earlier yields have been given in preceding reports.

17. The results to date are given below :—

Bags per Acre 1936.		1. *With Immortel Shade.* *Lb. Dry Cocoa per Acre per Annum.* 1918-36.	1934.	1935.	1936.
4.5	(*a*) Budded at Stake	463	567	972	747
3.9	(*b*) Budded in Nursery ...	415	536	833	645
3.7	(*c*) Seedlings at Stake	438	426	710	612
3.8	(*d*) Grafted	432	519	866	629
		2. *Without Immortel Shade.*			
3.3	(*e*) Budded at Stake	392	496	835	538
4.2	(*f*) Seedlings at Stake	435	577	991	700

Trenched with pen manure in 1934.

The slight differences in yield in this experiment are probably not significant.

4.—*Colour of Pods Experiment.*

18. For details of this experiment the reader is referred to earlier reports. The results to date are given below and show a very great dominance of red over yellow. Although it is believed that some red varieties of cocoa are much hardier than yellow varieties this experiment cannot be considered a proof of that theory. Its chief interest lies in the yields which young budded trees grown without shade in a well drained soil can give without special treatment or manuring.

Plots.		*Yield lb. Dry Cacao Per Acre.* *Average* 1924-36.	1935.	1936.
1	Seedlings from tree bearing yellow pods	414	956	685
8	Seedlings from tree bearing light red pods	310	631	462
9	Seedlings from tree bearing dark red pods	366	653	576
	Total	1,090	2,240	1,723
2	Single bud from tree bearing yellow pods	405	1,026	865
4	Single bud from tree bearing light red pods	361	629	670
3	Single bud from tree bearing dark red pods	758	1,135	1,015
	Total	1,524	2,790	2,550

		Yield lb. Dry Cacao Per Acre. *Average* 1924-1936. *Yellow.*	*Red.*	*Total.*	1936.
5	One 'yellow' and one 'red' bud on same stock ...	136	344	480	797
6	One 'yellow' and one 'red' budded plant at same picket	147	223	370	741
7	One 'yellow' and one 'red' seedling at same picket ...	61	235	296	513

5.—*Trenching at River Estate.*

19. For a number of years it has been the practice to use River Estate as a dumping ground for vegetable and animal refuse from the Port-of-Spain stables. This has undoubtedly had the effect of making the estate what it is to-day. The soils, when the estate was taken by the Government in 1897, were worn out cane lands, very deficient in organic matter and plant foods. Most other cocoa estates in Trinidad started with an original complement of natural humus far in excess of that which has been applied to River Estate during the last 30 years. Hence people who criticise the adding of organic matter to River Estate as abnormal and costly must be grateful that they were spared the expense by having virgin soil naturally rich in humus.

20. Various methods of returning organic matter to the soil have been tried and pits, circular trenches and short deep trenches have given way to more efficient long shallow trenches. Professor Hardy has recently examined the trenching system and finds evidence of improved conditions for 6 to 8 years after the work has been done. Potash tends to wash out early and might be added to advantage after the trenches have been in operation for a couple of years. Tree excavations show that roots concentrate in the trenches where food supplies and water are to be obtained.

21. Tree excavations on other estates made up on the two row bed system show that cocoa feeding roots tend to be concentrated in the surface layers of soil in the ventana which have no drains. This has led to the trial of a new system of adding organic matter namely by spreading it in the non-drain ventana and roundridging over it to form turtle back beds. In a simple experiment now in operation this method is under trial with and without the addition of artificial fertilisers. The method has been much discussed by practical planters who accept it in preference to trenching, particularly on clay alluvial soils where deep drains are needed and where turtle back beds are a necessity. On such soils it is agreed that liming at 1-2 tons per acre should always *precede* roundridging and all organic matter available should be spread in the ventum so that it becomes *lightly* covered with soil.

22. The experiment already commenced in Field 3A and described in earlier reports is being continued for the present and results to date are as follows :

YIELD PER ACRE TRENCHED FIELDS (in pods).

	1932.	1933.	1934.	1935.	1936.
Debris + Pen Manure	5,703	8,131	6,934	8,189	5,715
Debris alone	4,906	4,731	4,702	6,502	4,244
Difference due to Pen Manure	797	3,400	2,232	1,687	1,471

Note that the difference in yield ascribable to Pen Manure was greatest in the second crop after trenching and in succeeding crops it decreased regularly but was still apparent in the 5th year.

23. Although no control plots were left for comparison it is probable that the manuring was valuable and the incorporation of Pen Manure with the normal debris was also beneficial.

24. The economics of adding organic material to estates of this nature are being thoroughly investigated since it was discovered that mulch gave much greater efficiency to fertiliser applications and it is a problem which many estates in the Northern Range of Trinidad will have to face shortly.

B.—MARPER ESTATE AND EXPERIMENTS IN PROGRESS THERE.

General.

25. The Agricultural Officer, Eastern Counties, reports :—

" The ordinary routine work for maintaining the estate in a good state of cultivation has been carried out as in previous years. Each field has been cutlassed, pruned and weeded at least once, while ground shade and supplies have been planted where necessary. Drains totalling 35,480 feet were reopened in fields 1-5 and in field 9. Spraying has become a normal routine operation on the greater part of the estate since it is evident that, as a result, the trees are healthier, produce larger and greener leaves which persist longer, and thrips have been almost non-existent.

Rainfall and Crops :—The annual rainfall for the past five years is shown in the following table :

	1932.	1933.	1934.	1935.	1936.
Rainfall inches ...	101·73	141·88	83·65	108·69	103·85

Heavy rains towards the end of 1935 materially reduced the prospects of a good dry season crop. Pickings from September to the end of 1936, however, were higher than usual and for the 1936-37 crop year a record yield is anticipated.

The crop reaped for the year amounted to 34,409 lb. plantation cocoa and 1,813 lb. black cocoa. The produce was sold to the Cocoa Planters' Association as usual. The total crop in bags of 165 lb. for the period under which the estate has been owned by Government are as follows :—

Year.	1930.	1931.	1932.	1933.	1934.	1935.	1936.
Bags ...	251	196	211	202	204	292	217

Many neighbouring privately owned estates have decreased in yields considerably during this period and large areas have been abandoned.

Witchbroom Control :—During the year complete rounds were made on the estate every two months when all witchbroom tissue was collected and destroyed. The number of brooms removed amounted to 448,500 or an average of 4,794 per acre. During the previous year 166,495 or an average of 1,800 brooms per acre had been removed. Thus there was an increase during 1936 of 282,005 brooms or 170 per cent. over the figures of 1935. Pod infection was also increased, the loss of crop from this disease being approximately 3·84 per cent.

The increase in apparent infection is not due to lessening of control efforts on the part of the estate, but is coincident with a very much increased infection generally in the district, especially on areas where no control measures have been possible owing to low revenues. On many experimental plots of other estates more than 50 per cent. of the pods were commonly affected during the period September to December, 1936, while Marper maintained an average well below 4 per cent. for the same period.

The following table shows the percentage loss of crop at Marper Estate as a result of witchbroom disease since 1932 :—

Year.	*Per cent. Witch-broom Pods.*
1932	0·87
1933	1·25
1934	1·33
1935	1·31
1936	3·84

The low pod infection figures for Marper Estate compared with other estates have been the subject of criticism ; accordingly, special checking has been instituted for the present crop. Details of an accurate count from September to the end of December, 1936, are shown in the following table :—

Field.	Acreage.	September.		October.		November.		December.	
		All Pods.	Witch-broom.	All Pods.	Witch-broom.	All Pods.	Witch-broom.	All Pods.	Witch-broom.
1	9.27	56	6	2,049	176	5,115	201	10,388	107
2	8.38	163	11	2,945	121	4,534	118	6,332	123
3	7.15	226	16	3,228	134	5,208	137	7,047	102
4	9.50	566	98	4,057	390	5,904	419	8,863	220
5	13.50	521	32	5,834	607	9,543	514	13,550	191
6	9.70	278	19	5,780	331	6,892	195	8,482	142
7	9.90	457	60	8,315	555	12,019	231	8,809	96
8	11.00	921	132	11,188	498	12,961	284	11,047	130
9	6.80	493	50	6,425	257	11,171	162	5,603	57
10	7.70	350	56	6,133	480	9,569	360	5,591	123
	92·90	4,031	480	55,954	3,549	82,915	2,621	85,712	1,291

The total number of pods reaped from September to the end of December was 228,612 of which 7,941 were affected by witchbroom disease representing a loss of 3·47 per cent.

The experimental work on Marper Estate is dealt with in the Agronomist's report. "

Experimental.

1. Manurial Experiments.

26. The fertiliser experiments have been critically examined and results analysed and published (Results of Manurial Experiments on Cocoa at Marper—"Tropical Agriculture", Vol. XIII, No. 9. pp. 233-241).

27. The summary of conclusions is reproduced below; profit figures being based on a value of 5 cents per lb. of dry cocoa exclusive of cost of manufacture. At present prices (14 cents) profits would be more than correspondingly higher and several treatments which gave increased yields but not at a profit would now be profitable.

Summary of Marper Manurial Experiments.

28. The most beneficial fertiliser in the series was undoubtedly Potash, applied at the rate of 300 lb. of Potassium Sulphate per acre. There is a net profit in this case of $3.28 per acre per annum.

29. Lime is also needed, and applications at the rate of five tons per acre give an increased yield of nearly 40 per cent. The cost of the treatment is greater than the increased revenue from the cacao at 5 cents per lb.

30. Phosphate gives a smaller actual increase in yield than Lime, but a profitable one. The profit from an application of 325 lb. per acre appears to be approximately $1.00 per acre per annum on the basis of 5 cents per lb.

31. Nitrogen gives *no benefit at all.* When applied with either Potash or Phosphate, it tends to decrease rather than to increase the beneficial effect of the other fertilisers.

32. Potash and Phosphate together did not give the great increase in yield anticipated from the increases obtained when each was applied separately. This may be due entirely to a lack of balance between actual quantities of Potash and Phosphate applied. While K_2P_2 gives no real benefit, K_2P_1 might conceivably be beneficial.

33. Although figures have not yet been analysed there is apparently no effect of manures noticeable on the incidence of witchbroom.

34. In March, 1936, as a result of the analyses of yields the plots were re-organised and each original plot of 5 × 5 trees was subdivided into two subplots of 2 × 5 trees using the centre row as a guard row.

35. The conversion of treatments was as follows :—

1. Lime Series — half plot Potash at 2 lb. per tree.
2. Potash Series — half plot Lime at 5 tons per acre.
3. Phosphate Series — half plot Lime at 5 tons per acre.
4. Potash and Phosphate — half plot Lime at 5 tons per acre.
5. Nitrogen Series — half plot Potash at 2 lb. per tree.
6. Nitrogen and Phosphate — Nitrogen only on half plot.
7. Nitrogen and Potash — do. do.
8. Nitrogen + Potash + Phosphate — do. do.

No results have as yet been obtained.

2. Shade Reduction and Drainage Experiments.

36. This experiment was laid down at Marper Estate in 1930. The soil is a rather heavy loam with a silty surface on the vegas.

37. Shade trees (Bocare Immortel) were originally spaced at 24 to 36 feet apart. This close spacing was thought to provide conditions favourable for high witchbroom development on account of the relatively high humidity maintained beneath the shade trees.

38. The present experiment was designed by Mr. Joseph de Verteuil, who was Agronomist at the time, to reduce this humidity and high witchbroom incidence by two methods :—

(*a*) By careful reduction of shade.
(*b*) By draining.

39. When the experiment commenced the cocoa trees were all mature and the original intention was to remove up to 100 per cent. of shade trees in stages by the following treatments :—

(*a*) No shade reduction.
(*b*) 16⅔ per cent. shade reduction for 3 years.
(*c*) 25 per cent. shade reduction for 4 years.

40. It was considered, however, that the treatments were too drastic and all thinnings stopped at the end of the second year.

41. Drains were in a very poor condition in 1930 and the draining treatments were :—

(*a*) Drains 26 feet apart
(*b*) Drains 52 feet apart
(*c*) Drains 104 feet apart
(*d*) No drains

} Drains 18 inches deep.

42. Plots were so arranged that each shade reduction treatment was given the four drainage treatments. In this way a proper analysis of the results could be made. Plots were all 2½ acres in extent and records were made of crop and witchbroom incidence.

43. It was unfortunate for the experiment that drainage treatment (*c*) happened to fall on undulating land which is strictly not comparable with the others for environment especially when comparisons of witchbroom incidence are required. As far as *crop* goes the difference in topography of the site probably has little effect beyond the beneficial effect resulting from slightly better drainage. The yield figures show very marked differences between close and wide draining treatments and since the defect in site has acted in the direction of reducing any differences, the actual differences in yield might have been even more marked in an experiment wholly situated on flat lands.

44. In Section II which deals with witchbroom incidence the divergence of the two sets of results is probably due more to the differences in topography of the plots than to actual treatment, for it is a well known fact that on undulating land there always tends to be less witchbroom than on water soaked flats. With this fact borne in mind the results can be examined.

Section I.

45. Section I deals only with the crop records, which are given in Table I. Shade trees at 24+24 feet was considered normal or 100 per cent. shade. Untreated plots averaged 80 per cent. shade on this basis.

46. Plots which received two thinnings of 25 per cent. finished with a shade value of 33 per cent. and plots, where two thinnings at the rate of 16⅔ per cent. were made, averaged half normal shade.

Table I.

YIELDS OF EXPERIMENT PLOTS 1930-35 IN LB. DRY CACAO PER ACRE.

Draining.	80 per cent. Shade Undulating Land.					50 per cent. Shade.					33 per cent. Shade.				
	'31	'32	'33	'34	'35	'31	'32	'33	'34	'35	'31	'32	'33	'34	'35
Drains at 26 ft.	390	220	310	310	540	470	310	240	330	440	590	380	350	400	740
Drains at 52 ft.	360	240	360	240	370	430	310	420	410	540	400	250	310	310	480
Drains at 104 ft. undulating land	490	360	410	420	670	280	140	150	150	360	270	150	100	180	390
No drains	480	280	410	370	550	380	240	200	280	510	290	140	170	270	480

By inspection the Table shows that with close drains the highest yields occur on plots where most shade reduction was carried out, whereas with no drains the reverse is the case.

Section II.

Witchbroom Incidence.

47. Table II gives the actual incidence per acre over the five-year period 1930-35.

Table II.

TOTAL BROOMS IN HUNDREDS PER ACRE.

Draining.	80 per cent. Shade.					50 per cent. Shade.					33 per cent. Shade.				
	'31	'32	'33	'34	'35	'31	'32	'33	'34	'35	'31	'32	'33	'34	'35
Drains at 26 ft.	17	17	15	9	5	30	29	30	19	14	43	67	59	53	34
Drains at 52 ft.	11	10	13	11	6	36	22	32	25	19	61	31	34	28	17
Drains at 104 ft.	14	10	16	10	8	18	14	9	11	7	21	15	9	5	3
No drains	10	9	17	8	4	30	23	14	9	8	21	24	26	12	10
Totals	52	46	61	38	23	114	88	85	64	48	146	137	128	98	64
	220					399					573				

Table III.

REDUCTION OF BROOM INCIDENCE OVER EXPERIMENT PLOTS
TOTAL BROOMS IN HUNDREDS ON 2-ACRE PLOTS.

	Shade.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.
Drains 2 and 4 rows apart	80%	28	27	28	20	11
	50%	66	50	62	43	33
	33%	103	98	93	81	51
Drains 8 rows apart and no drains	80%	24	19	33	18	12
	50%	47	36	23	20	15
	33%	42	39	35	17	13

48. It will be seen that if drainage treatments $(a)+(b)$ and $(c)+(d)$ are grouped there is a general increase in witchbroom incidence from plots where no shade was cut, to plots where 67 per cent. shade was removed. This suggests that the removal of shade might be responsible for greatly increased infection but in reality as the shade was removed thrips came in as an additional factor. Thus the increased flushing, which was exaggerated on account of thrips may have caused much of the high witchbroom incidence. Since the plots have been sprayed with Bordeaux Mixture thrips have been driven out and witchbroom incidence decreased by 50 per cent. by 1935.

49. From this experiment the conclusion may be drawn that in the substituting of shade to cocoa by drains on a soil type where this substitution is practicable there is likely to be some increase of witchbroom at the start, accompanying the flushing which takes place in the trees as a response to change of environment. This may only be a temporary feature, disappearing as soon as the trees settle down again.

50. Reduction of shade, however, may give an opening for thrips which will cause more severe flushing than would normally take place. This opens up the question of whether the 18-inch drains in the experiment were adequate in replacing the shade trees removed, since thrips often occur and do very serious damage to water-logged and/or exposed cocoa trees.

51. The experiment has been planned to go further in the future as a result of these deductions. We require to know now whether deeper drains would not have been more effective and whether with deeper drains and good roundridging shade reduction up to nearly 100 per cent. could not be carried out to advantage. During this second era of the experiment precaution will be taken against thrips incidence causing complications by continuing the annual spraying with Bordeaux Mixture. In addition it is hoped that yields will further be increased by the addition of suitable fertilisers. This outlines the policy which is recommended for cocoa on similar alluvial flats :—

1. First put the environment as near as possible at optimum conditions.
2. Secondly, put the trees in order as they are the manufacturers of cocoa.
3. Thirdly, feed the trees for maximum crop production at minimum cost.

52. It is an unquestioned fact that the only salvation of cocoa is increased yields. Increased yields will come in the future from properly fertilised fields but it is not economic to manure dud trees or trees needing pruning or draining or shade reduction, with expensive fertilisers. Increased yields will be necessary to pay for witchbroom control and leave a margin of profit.

C.—MANURIAL EXPERIMENTS WITH COCOA ON NON-DEPARTMENTAL ESTATES.

53. A list of latin square type experiments which are already in operation is given below. Those marked Code No. A 15 and onwards are new and have not yet given one complete crop.

Estate.	*Code No.*	*Particulars of Experiment.*
Las Hermanas I ...	A 2	Superphosphate trial on alluvial—clays—interaction with Potash.
Las Hermanas II ...	A 3	Comparison of varieties of Phosphates—interaction with Potash and Nitrogen.
Las Hermanas III ...	A 4	Comparison of varieties of Phosphates—interaction with Potash.
Rio Claro IIIa Poole Syndicate	A 5	Comparison of varieties of Phosphates—on marly clays—interaction with Potash.
Rio Claro IIIb Poole Syndicate	A 6	Comparison of varieties of Phosphates—on marly clays—interaction with Potash.
Rio Claro IV Poole Syndicate	A 7	Calcium Sulphate trial on marly clays—interaction with Potash and Phosphate.
Ortinola	A 15	Time of application of Potash on sandy alluvium. Basic Phosphate.
Santa Carlotta ...	A 16	Time of application of Phosphate on alkaline clays.
El Reposo	A 17	Time of application of Phosphate on Sangre Grande alluvium.
Palmiste	A 21	Potash v. Phosphate on marly clay.
Roxborough, Tobago ...	A 22	Trenching with coconut husks, Interaction with P and K.
King's Bay, Tobago ...	A 23	Potash v. Phosphate on Tobago detritis.
Richmond, Tobago ...	A 24	Potash v. Phosphate on clay alluvium. Interaction with Lime.
Grand View	A 25	Capital v. current expenditure on Phosphate neutral clay.
Santa Estella I ...	A 26	Capital v. current expenditure on Phosphate—acid alluvium.
Santa Estella II ...	A 27	Capital v. current Lime on acid clays.
Perseverance I ...	A 28	N.P.K. trial after liming acid Talparo clays.
Perseverance II ...	A 29	Optimum quantity of Lime on Talparo clays.
Santa Anna	A 30	Potash v. Phosphate on acid clay alluvium.
El Reposo	A 31	Potash v. Phosphate on acid clay alluvium. Interaction with Lime.
Guapo I	A 32	Buccaneer v. Superphosphate on acid alluvial. Interaction of Lime and forking.
Guapo II	A 33	Buccaneer v. Superphosphate on acid alluvial. Interaction of Potash and forking.
Santa Severa... ...	A 34	Muriate of Potash on Brasso clay. Lime and Phosphate as basic dressing.
Santa Cruz	A 35	Capital v. current Potash on sandy loam.

Results.

a. Acid Alluvial Soils.

54. Experiments (A 2, 3 and 4) on acid alluvial clays at San Rafael have shown :

(i) That small annual dressings of Superphosphate have been beneficial on these soils and have given profitable increases with cocoa as low as 6 cents per lb.

(ii) That prepared soluble Phosphates have as a class given better or at least quicker returns than insoluble Rock Phosphates.

(iii) That Potash although slightly beneficial was not profitable and Nitrogen applications were not even beneficial.

Experiment Code No. A 2.

Effect of Superphosphate—Las Hermanas Estate.

Amount per tree per annum.	Per cent Increase in Yield of Wet Cocoa (lb.)				Total Yield per 72 trees.	Total Increase over control in lb. dry cocoa.	Cost of fertiliser and application.
	1933.	1934.	1935.	1936.			$ c.
3 lb.	78.3	141.5	61.7	11.4	989	152.4	11.52
2 lb.	41.2	59.8	25.7	7.4	787	71.6	7.68
1 lb.	46.3	48.8	54.9	31.8	881	109.2	3.84
Control	—	—	—	—	608	—	—
Total Yield ...	990	533	949	793	3,265	—	—

Experiment Code No. A 3.

Comparison of Varieties of Phosphates
Yield of Wet Cocoa from 110 Trees, 1936.

Treatment.	Yield in lb. wet cocoa.	Per cent Increase over control.
3 lb. Mineral Phosphate	253	11.9
3 lb. Superphosphate	298	31.9
1¼ lb. Nicifos A	290	28.3
1½ lb. Double Super	306	35.4
Control	226	—

Experiment Code. No. A 4.

Comparison of Varieties of Phosphates on Acid Alluvium Yields in lb. of Wet Cocoa per 90 Trees.

Treatment.	1934 Natural Yields	1935. Increase over 1934 yield	1936. Increase over 1934 yield	Average per annum	Per cent increase over control
Control	90	139	29	84	—
2 lb. Superphosphate	77	222	76	149	52
2 lb. Superphosphate + 1½ lb. Potash... ...	69	240	79	160	72
3 lb. Mineral Phosphate	77	186	71	129	38
2 lb. Mineral Phosphate + 1½ lb. Potash ...	82	237	99	168	58

b. Black Marl Soil.

55. Experiments (A 5, 6 and 7) on Black Marl soils at Rio Claro have shown :—

(i) That Superphosphates have given very spectacular increases in yield in the first year.

(ii) That Rock Phosphates in the same period gave very low returns.

(iii) That neither Potash nor Nitrogen were instrumental in increasing yields.

(iv) That gypsum in the soil may have a detrimental effect on yields.

Experiment Code Nos. A 5 and A 6.

COMPARISON OF PHOSPHATIC MANURES ON BLACK MARL SOIL, 1935-36
YIELDS IN BAGS PER 1,000 (14×14).

Treatment.	Expt. I	Expt. II	Average.	Per cent Increase.
Superphosphate	16.46	16.1	16.28	74.1
Double Super	14.20	12.1	13.15	40.6
Nicifos A	12.2	13.1	12.65	35.3
Mineral Phosphate	9.3	11.5	10.40	11.2
Control	11.0	7.7	9.35	—

Experiment Code No. A 7.

EFFECT OF GYPSUM ON ACTION OF SUPERPHOSPHATE.

Treatment.	Yield Pods per 100 trees (1935-1936).
6 lb. gypsum per tree = 100 per cent. gypsum 0 per cent. Phosphate ...	1,069
4 lb. Superphosphate+4 lb. gypsum = 80 per cent. do. 20 per cent. do. ...	1,710
4 lb. Superphosphate = 60 per cent. do. 40 per cent. do. ...	1,726
2 lb. double Super = 0 per cent. do. 100 per cent. do. ...	1,733
Control = 0 per cent. do. 0 per cent. do. ...	1,258

56. In general it is concluded that provided a cocoa field is in reasonable order profitable increase in yield can be obtained by applying suitable fertilisers but it is felt that even in the experiments described the tree population and field cultivation may be inhibiting better results from the fertiliser.

57. The bulk of experiments now in progress on estates other than those belonging to the Department have been made possible through the co-operation of the owners of the estates concerned, and the Department gratefully acknowledges the help received from owners and managers of these estates.

D.—EXPERIMENTS WITH TONKA BEANS.

58. These include :

(*a*) Experiments on young plants, methods of planting and treatment during the pre-bearing period.

(*b*) Experiments on mature bearing trees.

(*a*) Experiments on Young Plants.

59. The majority of Tonka Beans grown in Trinidad are planted on the poorest possible soil on account of a superstition that the more hardships the plant receives the better will it bear. The truth of the matter probably is connected with the fact that these trees thrive best in well aerated and well drained soils. They will make a good show on gravel soils where cocoa will not thrive but on these soils although the trees grow and head well once they get over the initial static period, cropping usually is poor. The average time taken for trees to come into bearing is generally at least 5 years and by that time they stand about 10 feet high.

60. On River Estate a very infertile area of " Tonka Bean " soil was cleared and planted with young nursery plants towards the end of 1935. Proper holes were prepared which were liberally supplied with organic matter. The young plants were shaded at first heavily and later lightly with pigeon peas, cassava, tannia and bananas of various types and they were mulched with copious organic matter. At the age of 12 months the plants averaged nearly four feet high and approximately 5 per cent. flowered. Flowers were removed from all but two and these matured half a dozen fruit each. Similar experiments are being inaugurated on outside estates. The moral is that the Tonka Bean needs just as much care and attention when young as other crops.

(*b*) Experiments on Mature Bearing Trees.

61. These experiments were laid down because the normal Tonka Bean tree assumes a bi- or triennial bearing habit. This may be largely due to the poor soil on which the majority are grown. Certain trees at River have been noted to crop annually but on most estates it is found that trees which produce a heavy crop in one year rests for one or two crops before producing a second crop. This looks like a case of food deficiency, hence a number of experiments have been started in which Pen Manure, Potash and Phosphate have been used to try and increase crop. Up to the present there have been no spectacular results reported except in the case of a poor Brasso sand where 12 lb. of a mixture of Potash and Phosphate were applied per tree. We have evidence in other crops that where trees have been starved for long periods they need a very big initial impulse to set them moving.

62. Fertiliser experiments are being laid down early in 1937 on young plants to determine whether the erratic bearing can be stopped if the trees grow up without these soil deficiencies, particularly when Phosphates are supplied early.

63. Vegetative and seedling progeny trials have been laid down for certain heavy bearing trees at River Estate.

List of Experiments with Tonka Beans (Commenced or provided for in 1936).

Estate.	
Monte Cristo ...	...8 blocks of 100-200 trees received various fertilisers—3 similar blocks as controls.
Matura ...	...3 blocks of 75 trees received various fertilisers—1 block for control.
Guapo I ...	...Randomised Block fertiliser trial on seedlings 1 year old. Postponed till 1937.
Guapo II ...	...8 blocks of 12 trees N. P. K. without Lime 1 year old with Lime.
Maracas ...	...4 blocks of 20 trees in P× K trial—also edge of paddock experiment.
Ansaldi (C. de Verteuil)	...4 blocks of 30 trees in P× K trials.
River Estate ...	...Pen Manure v. artificials trial—strip treatments.
Guapo III ...	...Natural records of 34 selected heavy bearing trees.
River Estate ...	...Natural records of 556 trees in one block.
Guapo IV ...	...Seedling progeny trial of 24 best bearers on estates.
River Estate ...	...Seedling progeny trial of 6 best bearers on estate.
River Estate ...	...Seedling progeny trial of 6 "dwarf" trees.
River Estate ...	...Layered progeny trial "dwarf" v. "normal" trees.
River Estate ...	...To commence in 1937—fertiliser trial on 1-year-old seedlings.
River Estate ...	...To commence 1937—Budded progeny trial of "dwarf" and "normal" trees—on clonal rootstocks.
River Estate ...	...Tonka Beans reared under cocoa v. ditto reared where land clear felled.
River Estate ...	...Tonka Beans planted 10′ × 10′ and thinned at 10 years v. wider spacing from start.
Guapo V ...	...Monthly observations of flush, flowering, &c., of 24 individual trees.
River Estate ...	...Budded progeny on seedling rootstocks.
River Estate ...	...Demonstration with coffee. N. P. K. + Pen Manure.

E. 1.—GRENADA COCOA EXPERIMENTS.

64. The results of fertiliser experiments conducted at Balthazar and Dunfermline suggest that organic matter is the chief consideration for Grenada soils. In the presence of Pen Manure artificials were very beneficial. Liming also appeared to be beneficial.

65. A completely new series of experiments has been suggested and it is hoped will be laid down in 1937. They are designed to answer the following problems :—

1. The value of liming.
2. The value of pen manuring and forking.
3. The value of Phosphates and Potash with and without Pen Manure.
4. Special methods of applying Phosphates in soils which fix Phosphates and reduce their availability for the tree.
5. Comparison of varieties of Phosphates.
6. Time of application of fertilisers, Lime and Pen Manure.

66. The above suggestions were made consequent upon a visit made to Grenada in November, 1936. In the report it was stressed that much can still be done on Grenada estates in replacing dud cocoa trees by healthy supplies, in conserving humus and paying more attention to windbreaks as the cocoa fields grow older.

E. 2.—ROOT STUDIES IN COCOA.

67. Mr. Mulloon has been making a study of root distribution in cocoa at intervals during the year. Trees excavated at Sangre Grande confirmed earlier excavations made on other estates that cocoa roots are mainly restricted to the surface 6 inches of soil and with the chequerboard system of draining every alternate row, the four trees on a bed concentrate their roots in the centre of the island with the feeding roots massed in the surface humic layers. Excavations at Rio Claro confirmed this distribution, suggesting that if manures are to be applied at the feeding roots they must not be broadcast within 2 ft. of the trunks. Tap roots often descend to a depth of 3 to 5 ft. with occasional bifurcations. These studies are being extended.

E. 3.—EXPERIMENTS ON OTHER CROPS.

68. A number of new fertiliser experiments have been designed for grapefruit and other citrus. These are to cover the effects of Lime, Nitrogen, Potash, and Phosphates on bearing trees on some of the soil types of the island. Several of these experiments have been already started and are now under the control of the Manager of the Citrus Experiment Station.

69. Provision has been made for increasing and augmenting the present fertiliser experiments on coconuts in the coming year.

70. Several simple fertiliser and cultivation experiments on bananas have already been started as demonstrations chiefly by the Banana Officer. The economics of fertilising bananas is at present highly speculative. On one estate in Grenada which was visited recently, Gros Michel bananas failed to grow at all until the soil was limed, forked with Pen Manure and liberally supplied with Ammonium Phosphate. Operations such as this are needed on many of our soils if bananas are to be grown successfully but the cost may prove prohibitive with the present small margin of profit.

E. 4.—A SOIL AND AGRICULTURAL SURVEY OF THE RIO CLARO-PRINCES TOWN AREA.

71. A soil and agricultural survey was made of the Rio Claro-Princes Town district in the summer of 1936. The area surveyed covered approximately 35,000 acres most of which was planted with cocoa. The team of officers working under the direction of the Agronomist comprised Dr. Chenery, Mr. Montserin, Mr. Mulloon, and Mr. Guevara.

72. The soil types and their potentialities are very briefly presented in the following table :—

SOIL TYPES AND CROPS—RIO CLARO TO PRINCES TOWN.

Soils.	Crops and Condition.
Black Marl	Good for cocoa, oranges and bananas. Needs Pen Manure, Phosphates and draining. Tonka Beans failed.
Calcareous Green Clay ...	Good for cocoa, oranges and bananas. Needs Pen Manure, draining and cultivation.
Non-calcareous Clay ...	Very little in extent. Good for oranges ; poor for cocoa and bananas unless worked.
Red Weathering Clay ...	Very difficult soil. Needs much cultivation for all crops. Needs liming, draining and humus.
Moruga sands and silts ...	Seems to have good potentialities. Probably low in nutrient elements especially Phosphate. Need draining and liming.
Alluvials	Depend on parent soil. Generally good for cocoa, bananas and citrus. Need draining and liming badly.

F.—SUMMARY OF CONCLUSIONS.

73. The work of the year 1936 has emphasised several important features of agriculture in Trinidad and Tobago. These are centred around the fact that in the past land has been purchased for the value of the latent fertility in its soil which the planter then proceeded to convert into cash through the medium of some crop of economic importance until such fertility was exhausted. Practical exhaustion has usually been reached when the annual capital put into the estate by way of cultivation is not covered by the value of the revenue from the crop reaped and then the area is abandoned.

74. This point of view is rapidly disappearing in other countries and in modern agriculture the planter uses the soil with whatever chemical and physical attributes it possesses as a medium to which manures and cultivation can be applied in order that the plants selected to grow in it may, like machines, convert this invested capital into profits for the grower. In Trinidad standards of agriculture are often low with consequent low yields per acre. Consequently large areas are required to give any reasonable return. We are beginning to realise that intensive work on smaller areas may now be more profitable.

75. During 1936 we have made a great step forward in defining "intensive work".

76. The first fault to be corrected is the tree population where every unit, instead of, as at present, some 50 per cent. of units, must be capable of pulling its weight in the field.

77. Secondly, each unit must be maintained as near as possible at its maximum efficiency—physiologically young trees are more efficient than decrepit old trees.

78. Thirdly, all operations of a cultural and manurial nature which have been proved by experiment to be beneficial must be concentrated on the perfected population for most of these operations are complementary and the one gives its maximum expression in the presence of adequate quantities of the others.

79. It will be very expensive to carry out this work on some of the older cultivated areas of the colony for depredations on the natural fertility of the soil during centuries have left it in a very poor condition During the past there has usually been some attempt made to rejuvenate trees but no attempt to rejuvenate soils. At the present time both operations are badly needed.

F. J. POUND,
Agronomist.

REPORT OF THE MANAGER, RIVER ESTATE.

The year was, on the whole, a satisfactory one and although the cacao crop was below the average of the previous three crops the shortage was insignificant in comparison with the general slump of the colony's output. Limes, Tonka Beans and Coffee all yielded record crops whilst Grapefruit and Oranges although short of the previous year's production brought in a record amount of revenue.

2. The total rainfall registered during the year was 63·79 inches which was slightly below the average of the district. Although precipitations during the critical months for cacao—November and December—were not heavy, there was exceptional humidity and lack of sunshine which resulted in a serious loss of young fruit. The figures for the Cacao crop for the last five years are of interest :—

	1932.	1933.	1934.	1935.	1936.
Total bags of 165 lb. ...	1,325	1,164	1,199	1,232	1,021
Acreage	457	440	440	418	418
Bags per acre	2·89	2·64	2·72	2·94	2·63

Revenue and Expenditure.

Revenue.

3. The total revenue for the year amounted to $18,669.79 which is the highest sum realized since 1929. Of this amount a sum of $5,327.62 was obtained from sources other than cacao and constitutes a record in this direction. This increase of revenue was due to better cacao prices during the latter part of the year and to the steadily increasing production of subsidiary crops. Selected cacao pods to the value of $618.90 were supplied free of charge to the St. Augustine Nurseries for the purpose of raising seedling plants for distribution to planters under the Cacao Subsidy Scheme.

Expenditure.

4. Expenditure for the year amounted to $24,488.04 ; of this amount sums of $2,789.37 ; $2,792.20 ; $1,448.78 and $623.29 were expended against capital, on crops other than cacao, experimental work and timber plantations respectively. An independent sum of $2,253.78 was obtained as a grant from the Cacao Subsidy Board and expended as detailed below,

Cacao.

5. The cacao crop for the calendar year amounted to 1,021 bags of 165 lb. each and was disposed of through the Cocoa Planters' Association at an average price of 7½ cents per lb. for 1st grade produce as against 4·9 cents per lb. obtained for the previous crop. The cultivation was well maintained and all routine work carefully attended to. The following fields were trenched with pen-manure ; about ¼ of Field No. 22A which had not been completed in 1935, the shaded portions of Nos. 20 C and D, the whole of Nos. 22 B and C, about ¾ of No. 16 and the western portion of Field No. 12 along the Bagatelle Road.

Diseases and Pests.

6. There has been no abatement from the ravages of witchbroom, thrips, beetles and algal disease. All continue to increase and often occurring in conjunction, do not tend to lessen the afflictions of the planter, even the most optimistic of whom, must now realize that the days of cacao as a forest crop in Trinidad are definitely numbered. The young cacao variety trial plots in Field No. 19 were seriously affected by all these troubles and it was necessary to resort to spraying with Bordeaux mixture as a control against thrips and algal disease. Mention was made in last year's report of the damage caused by leaf-eating beetles. These pests are continuing their activities to an alarming extent and it is possible that they mutilate to a greater or lesser degree at least 90 per cent. of the leaves on every young flush during the months of December, January and February.

7. During the year 57,762 brooms were removed and buried. In 1934 and 1935 the number of brooms collected was 875 and 5,287 respectively. Pod infection which was insignificant up to the end of the last crop is now rapidly on the increase. 30,377 adult cacao beetles and 55,020 grubs were also collected and destroyed. Beetles were particularly harmful to young cacao supplies.

Cacao Subsidy.

8. A sum of $2,253.78 was obtained from Cacao Subsidy funds and expended as follows :—

9. *Cacao Rehabilitation.*—Rehabilitation work was started on an area of 48 acres comprising the whole of Fields Nos. 5 and 13 B., about ¾ of No. 13 A, most of No. 16 and about ½ of No. 12. In these fields the trees were topped and otherwise heavily pruned, " dud " cacao trees were dug out and replaced with supplies of known good parentage and ground shade planted in all open spots. Except in Field 5 which could not be dealt with in time all supplies over this area were given an application of pen-manure. *Interplanting with auxiliary crops* was carried out over an area of approximately 40 acres. The areas dealt with were the whole of Field No. 18 B and the bad sections of Fields Nos. 12, 13 A, 17 A, 17 B, which have all been interplanted with coffee and tonka beans, while a large portion of Field No. 4 A has been interplanted with timber trees. These areas were all pruned previous to interplanting and all the young coffee and tonka bean trees in Fields Nos. 12 and 13 were given an application of pen-manure. *Fertilizer* consisting of 2 lb. Sulphate of Potash and 2 lb. Superphosphate of lime per tree was applied over an area of approximately 80 acres which included the following fields Nos. 6A, 6B, 6C, 8A, 8B, 8C, 9C, the rehabilitated portions of Fields Nos. 13A and B, and the colour of pod experiment in Field No. 25B.

Summary of Expenditure under Cacao Subsidy Grant.

	Acres.	$ c.
A. Cacao Rehabilitation	... 48	= 540.03
B. Interplanting Auxiliary Crop Plants ...	... 40	= 311.48
C. Fertilizers	... 80	= 1,402.27
Total ...	...	= 2,253.78

Experimental Work.

10. Experimental work, which continues to increase apace has been extended to include crops other than cacao and there are now few fields which do not contain experimental plots. All such work comes under the control of the Agronomist, to whom all records are submitted for compilation and report. The extent and variety of the experiments now being conducted should lead to very definite results within the next few years. Details are given in the report of the Agronomist.

Grapefruit and Oranges.

11. The whole orchard was maintained in good order throughout the year. Fertilizer treatment consisting of 2 lb. Ammo-phos. and 1 lb. Sulphate of Potash per tree was applied throughout and all diseased trees were removed and replaced with healthy " Marsh " plants. Gummosis disease continues all the time among the older and low-budded trees but its incidence is not increasing and it is hoped, with improved drainage, regular fertilizing and by continued removal of diseased trees as they occur, to reduce the incidence of the disease to negligible proportions. The whole area was again carefully tested for " Seediness " and a block of 3½ acres was completely rogued of all trees which were not Marsh seedless and their vacancies supplied with plants of this variety. This block now furnishes a source of supply of bud-wood. It has been the policy, for the past few years to dump all manure from the estate's pen on the citrus orchard which in turn has provided a regular and ample fodder supply during the same period. In practice it has been found that the fodder from one acre of citrus will support approximately one cow and in return the pen-manure from one cow is ample for the needs of one acre of citrus.

12. Crops were as follows :—

Grapefruit :		
2,025 cases shipped to Packers realized	$1,271.20	
Seeded and culled fruit sold locally	81.29	$1,352.49
Oranges :		
313 cases shipped to Packers realized	$167.75	
Navel, King and Cocoa oranges realized	408.92	$576.67
Shaddocks sold locally realized	$30.96	$30.96
		$1,960.12

Mangoes.

13. The Mango plot was again very disappointing which proves definitely that this crop is not adapted to its situation. It is proposed during the current year to interplant the greater part of the area with King Oranges and gradually cut out the mango trees as the oranges develop.

14. Mangoes to the value of $31.30 were sold.

Limes.

15. This crop, which was a record one, has shown a steady increase during the last 3 years and no less than 1,581 barrels of 160 lb. each was obtained. Unfortunately prices were extremely low and the greater part of the crop was disposed of at 70 cents per barrel cash, with a reservation of a share profit agreement. 64 barrels of green limes were delivered to the Citrus Growers' Association for shipment but these have not yet been accounted for. The total revenue from limes amounted to $1,098.03.

16. During the year five more lime contracts were taken over and it is hoped that the current year's crop will be in the vicinity of 2,000 barrels. A fertilizer treatment of 2 lb. Ammo-phos. and 1 lb. Sulphate of Potash per tree was given.

17. The lime crops during the past 3 years have been —

1934.	1935.	1936.
760 brls.	901 brls.	1,581 brls.

Tonka Beans.

18. This crop was also a record one and amounted to approximately 846 lb. which realized a sum of $1,230.92. Besides this 30 layered plants were sold for a sum of $7.50. Development and extension of this cultivation is proceeding apace and several experimental plots have been laid out. These are Manurial experiments and Layered versus Seedling plots. It is worthy of mention that one young layered plant is now carrying its third consecutive crop within a little over 4 years of life. There was some loss of crop owing to larceny and it was necessary to exercise very strict watchfulness which resulted in the capture and conviction of two culprits.

19. The Tonka Bean crop in detail was as follows :—

		Lb.		$ c.
Cured Beans (sold to highest Bidder at Port-of-Spain)	=	589¼	realized	893.77
37,047 pods for plants (sold to Planters in various parts of the Colony)	=	205¾	do.	337.15
9,280 pods for plants (for River Estate and contractors)	=	51¼	do.	—
		846		$1,230.92
30 Layered plants sold at 25 cents each	=			7.50
Total	=			$1,238.42

Coffee.

20. Here again a record was established and a crop of 6,474 lb. of Robusta coffee as against 5,280 lb. in 1935 was reaped and sold for a sum of $310.24. Unfortunately, however, the price obtained was also a record minimum one and worked out at less than 5 cents per lb. Many of the young trees planted along the hedge rows of the cacao fields are now coming into bearing.

Timber.

21. Seven more contracts were taken over during the year and 3,200 ft. of new bridle road was constructed on the Covigne section. Not as much work was otherwise done to the timber plantations as was desirable owing to limited staff and time.

Other Economic Plants.

22. The Pimento and Clove trees (50 of each) planted at the end of 1935 are making slow but satisfactory growth. A plot of 24 budded Avocado pear trees of the type found most suitable for carriage in cold storage was laid down during the latter part of the year on an intervening piece of ground between the "Progeny" and "Colour of Pod Experiments" in Field No. 25B. 62 stems of Gros Michel Bananas were shipped through the Banana Board and realized a sum of $20.98.

Stock and Motor Lorry.

23. The stock comprises 4 horses, 3 mules, 3 cows, 3 heifers, 2 calves and a pure bred Holstein Bull. Two young bull calves were sold in December for $30.00. The "K.P." filly (Princess Pat) was broken to work and has developed into a very fine animal. Pasture and Service fees for the year amounted to $172.38. The stock all kept well during the year.

24. The Motor Lorry gave continuous service transporting produce and manure to and from Port-of-Spain. The inclusive operating cost of this truck during the year was $1,250.07.

General.

25. The natural surface trace leading to the Tonka Bean field in Cascade (now Trace 22) and measuring 1,651 ft. was straightened out, thoroughly gravelled and fitted with 6 new reinforced concrete bridges. This is now an "all-weather" road for cars or trucks and is proving most useful. Minor repairs and some painting of buildings was carried out by the Public Works Department but a good deal remains to be done in this direction.

Visitors.

26. The staff and students of the Imperial College of Tropical Agriculture visited the Estate in January and the Ortoire District Agricultural Society in May. The staffs and senior pupils from several schools in neighbouring districts visited at various times whilst planters and members of the staff of the I.C.T.A., and Department of Agriculture paid frequent visits throughout the year. Planters in general are taking a keener interest in the activities of River Estate.

27. Statements in connection with the working of the Estate are attached.

RODERICK O'CONNOR,
Manager, River Estate.

RIVER ESTATE.

Statement of Revenue and Expenditure for the year ended 31st December, 1936.

Particulars.		Revenue.	Particulars.	Expenditure.
	$ c.	$ c.		$ c.
By sale of :—			Personal Emoluments	5,073 74
Cacao (Manufactured) ...	13,290 75		66—Maintenance	13,526 09
Cacao Pods	51 42	13,342 17	67—Travelling (Lorry)	988 55
			68—Incidentals	347 68
Grapefruit	1,352 49		69—Timber Contracts	925 58
Oranges	576 67		70—Improvements	1,620 45
Shaddocks	30 96	1,960 12	71—Fertilizers	400 00
Mangoes		31 30	72—Materials	598 71
Limes		1,098 03	73—Stock	527 22
Tonka Beans		1,238 42	74—New Cacao Varieties... ...	480 02
Coffee		310 24		
Pasture and Service Fees ...		172 38	*Cacao Subsidy* :	
			Expenditure ...$2,253 78	
Miscellaneous :—				
Firewood, Provisions, &c. ...		324 36		
Bananas		192 77		
		$18,669 79		$24,488 04

RIVER ESTATE.

Rainfall for the year ended 31st December, 1936.

Date.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1 ...	.10	.14	.28	.25	—	.30	.10	.13	—	.72	—	—	
2 ...	—	—	—	—	—	—	.49	—	—	—	—	—	
3 ...	—	—	—	.45	.18	—	1.20	.45	—	.62	.12	.54	
4 ...	—	—	—	.84	—	.10	—	—	.39	—	—	.21	
5 ...	.14	—	—	.72	—	1.85	.72	—	—	.75	.14	.24	
6 ...	.03	.08	—	.29	—	.10	—	.15	.15	.20	—	—	
7 ...	—	.14	—	—	—	.25	.75	.48	—	.36	.42	.42	
8 ...	—	—	—	.22	—	—	—	.20	.36	.16	—	—	
9 ...	—	—	—	.68	.80	.52	.30	.18	—	—	—	—	
10 ...	.18	—	—	.44	.01	—	.10	.45	—	—	.65	—	
11 ...	—	—	—	—	—	.44	1.30	—	—	.91	.60	—	
12 ...	.46	—	—	—	.18	.25	.12	.21	—	—	.62	—	
13 ...	.14	.16	—	—	1.90	—	—	—	—	.25	—	.32	
14 ...	.06	—	—	—	.15	.04	.75	—	1.97	—	.09	—	
15 ...	—	—	—	—	—	.34	.44	—	.17	—	.72	.19	
16 ...	—	—	—	—	—	.45	.55	.28	.09	—	.44	.32	
17 ...	—	.05		.12	—	—	.22	.46	—	.15	.41	.40	
18 ...	—	.04	—	—	—	.08	—	—	.45	.06	—	1.00	
19 ...	—	—	—	—	—	.54	.09	—	—	—	.06	.62	
20 ...	—	—	—	.30	—	.50	—	.19	.32	.12	—	—	
21 ...	—	—	—	—	—	—	—	.31	—	—	.30	—	
22 ...	—	—	—	.16	—	.42	—	.06	.78	.46	—	.10	
23 ...	—	—	—	—	—	—	.49	.12	—	—	—	.30	
24 ...	—	—	—	—	—	.14	.10	—	.10	.62	.66	—	
25 ...	—	.10	—	—	—	.50	.48	—	—	—	.40	.28	
26 ...	—	.25	—	—	.59	1.00	.22	1.86	.75	—	—	—	
27 ...	—	.05	.25	—	—	1.21	.44	—	.40	.12	—	.18	
28 ...	—	.06	.10	—	.09	—	.10	.16	1.42	—	—	—	
29 ...	—	—	—	—	—	.10	—	—	.29	—	—	—	
30 ...	—	—	—	—	.70	.19	.48	.82	—	—	—	.10	
31 ...	—	—	—	—	.30	—	.68	.52	—	—	—	.95	
Total ...	1.11	1.07	.63	4.47	4.90	9.32	10.12	7.03	7.64	5.50	5.63	6.37	= 63.79

RIVER ESTATE.

Progressive Abstract of Expenditure for the year 1936.

	$ c.	$ c.
"A"—Staff :		
Manager	2,160 00	
Overseer, Drivers, Watchmen	3,593 99	
Travelling, Messenger, &c.	458 25	6,212 24
"B"—Maintenance :		
Roads and Bridges	206 69	
Buildings, repairs, &c.	165 22	
Yard and Sanitation	577 31	
Grass Field	—	
Pastures	37 61	
Water—Service and River	52 99	
Materials (Tools, Bags, &c.)	578 96	
Visitors and other Public Services	488 47	
Miscellaneous (Fire Control)	11 55	2,118 80
"C"—Stock :		
Labour (Stock-keeper, grass-cutter, &c.)	710 06	
Materials (Stock-feed, repairs, harness)	576 89	1,286 95
"D"—Lorries.		
Labour (Chauffeur and attendant)	627 14	
Upkeep (Gasoline, Oil, Repairs, Insurance)	622 93	1,250 07
"E"—Nurseries :		
Layering Tonka Beans	54 31	
Maintenance of other nurseries	63 28	117 59
Total "A" to "E"	...	10,985 65
"F"—Cocoa Cultivation :		
Cutlassing	1,073 43	
Weeding and Stumping	437 67	
Trenching and Mulching, Manuring	830 72	
Supplying Cocoa and Ground Shade	54 03	
Pruning	677 40	
Draining and Roundridging	41 82	
Burying Pods—Bury Cacao Shells	110 63	
Shade Control	18 49	
Hedges and Borders	83 25	
Diseases and Pests, ants, beetles, squirrels	268 22	
Witchbroom	187 96	
Miscellaneous	—	3,783 62
"G"—Cocoa Manufacture :		
Reaping	1,688 93	
Curing and Bagging	493 79	2,182 72
Total "F" and "G"	...	5,966 34
"H"—Cocoa Experiments :		
Labour	1,448 78	
Materials	—	1,448 78
"I"—Orchard—Grape Fruit, Oranges and Mangoes :		
Upkeep, cutlassing, weeding and supplying	817 56	
Manuring (Fertilizers)	227 00	
Reaping	178 28	1,222 84
"J"—Limes :		
Upkeep—Cutlassing, Supplying, &c.	329 51	
Manuring (Fertilizers)	167 20	
Reaping	419 99	916 70
"K"—Tonka Beans :		
Upkeep, cutlassing	250 68	
Manuring (Fertilizers)	—	
Reaping	90 46	341 14
"L"—Coffee :		
Upkeep, cutlassing	18 82	
Manuring (Fertilizers)	—	
Reaping and hulling	175 11	193 93
Total "I" to "L"	...	2,674 61
"M"—Timber Cultivation :		
Upkeep, cutlassing, thinning vines	362 05	
Roads and Bridges	73 60	
Reaping, Sawing and Transport of Timber	187 64	623 29
"N"—Extraordinary.		
New Cultivations—		
Limes	480 93	
Bananas	60 26	
Tonka Beans and Coffee	899 25	
Timber	84 89	
New Roads, New Bridges and Buildings	717 87	
Purchase of Contracts and Advances	493 64	
Miscellaneous—Oiling Grapefruit, yard, Limes, &c.	52 53	2,789 37
Grand Total	—	24,488 04

Field No.	Bearing Trees.	Half Trees.	Quarter Trees.	Supplies	Dead or missing Trees.	Total.	Acreage.	Approx. Age.	No. bags of 165 lb.	No. bags per acre.	Remarks.
1 A ...	2,394	215	161	40	552	3,362	11.8	33-39	24.57	2.8	Trenched without manure, 1931-32, completed 1933: 2 acres bad cacao to be thrown out in 1937.
1 B ...	1,145	114	117	24	377	1,777	6.2	33-39	7.52	1.2	Trenched without manure, 1931-32, completed 1933: 4 acres bad cacao to be thrown out in 1937.
2 A ...	1,444	247	171	179	148	2,189	11.1	63-69	20.72	1.9	Experimental field, replacement of poor bearers.
2 B ...	1,331	276	139	100	55	1,901	9.6	63-69	14.31	1.5	do. do. do.
3 A ...	1,824	361	141	196	129	2,651	13.3	63-69	26.78	2.1	Part trenched without manure, part trenched with manure, part fertilized 1931.
3 B ...	1,572	250	67	25	291	2,205	11.3	63-69	20.17	1.8	No special treatment, about 4 acres to be planted in Tonka Beans and Coffee in 1937.
4 A ...	967	64	9	299	13	1,352	5.0	53-64	13.95	2.8	No special treatment, 4 acres derelict cacao, not included here, planted in Timber in 1936.
4 B ...	1,854	46	13	578	24	2,515	8.0	53-64	21.46	2.7	No special treatment, 2 acres derelict cacao, not included here, to be planted in Tonka Beans and Coffee in 1937.
5 ...	2,484	189	147	174	112	3,106	16.4	63-69	35.57	2.1	Shade and fertilizer experiment, suspended, whole field rehabilitated.
6 A ...	2,726	68	99	21	155	3,069	10.2	33-39	29.89	2.9	Trenched with manure, 1933: Fertilized 1936: Treatment given per tree, viz.:— Sulphate of Potash —2 lb Superphosphate —2 lb.
6 B ...	1,849	52	76	8	218	2,203	7.3	33-39	21.82	3.0	do. do.
6 C ...	1,727	47	69	10	121	1,974	6.6	33-39	20.82	3.1	do. do.
7 A ...	2,314	112	118	50	89	2,683	8.6	33-39	24.57	2.8	Trenched with manure, 1925.
7 B ...	2,074	81	91	10	62	2,318	7.5	33-39	27.51	3.6	To be cut out gradually for new experiments by I.C.T.A.
8 A ...	3,557	79	306	179	214	4,335	14.5	33-39	43.28	3.0	Trenched with manure, 1927: Fertilized 1936: Same treatment as Field 6.
8 B ...	1,398	66	105	95	108	1,772	6.0	33-39	18.34	3.5	do. do.
8 C ...	1,708	66	206	171	202	2,353	7.8	33-39	22.92	2.9	do. do.
9 A ...	1,839	119	158	74	115	2,305	7.8	33-39	28.07	3.6	Trenched with manure, 1928: Fertilizer experiment plots Same fertilizer used as in Fields 6 & 8
9 B ...	1,794	60	71	9	174	2,108	7.0	33-39	23.10	3.3	Trenched with manure, 1928-29: Fertilizer and Pen-manure experiment plots.
9 C ...	2,461	129	138	249	137	3,114	10.4	33-39	28.79	2.7	Trenched with manure, 1929-30: Dr. Briton-Jones pruning experiment, 1936.
10 A ...	1,574	87	73	585	—	2,319	7.5	33-39	17.61	2.3	Trenched with manure, 1930-31: Draining and Fertilizer experiment.
10 B ...	2,034	107	103	533	—	2,777	9.2	33-39	20.36	2.2	Trenched with manure, 1930-31.
11 ...	2,233	198	169	505	—	3,105	10.3	33-39	16.88	1.6	Trenched without manure, 1933: about 2 acres interplanted with Tonka Beans and Coffee, 1935 and 1936.
12 ...	1,675	191	753	767	92	3,478	13.8	33-44	19.81	1.4	Part trenched with manure late 1936: about 5 acres interplanted with Tonka Beans and Coffee in 1936.
13 A ...	2,371	105	141	185	673	3,475	14.0	33-44	39.97	2.8	Fertilized 1936: Part interplanted with Tonka Beans and Coffee 1936. Part Cocoa rehabilitated, 1936.
13 B ...	1,573	96	82	1	215	1,967	7.8	33-44	24.95	3.2	Fertilized, 1936. Cocoa rehabilitated, 1936.

COUNTING AND CROP RETURNS.—CONTINUED.

Field No.	Bearing Trees.	Half Trees.	Quarter Trees.	Supplies	Dead or missing Trees.	Total.	Acreage.	Approx. Age.	No. bags of 165 lb.	No. bags per acre.	Remarks.
14 ...	982	56	27	1	17	1,083	4.1	63-69	5.88	1.4	2 acres cut out 1935 and planted in Limes, remainder interplanted with Robusta Coffee.
15 ...	1,140	40	26	—	365	1,571	4.7	34-94	4.59	.9	Greater part interplanted with Robusta Coffee.
16 ...	1,888	44	50	232	512	2,726	8.7	34-69	22.03	2.5	Three-quarters trenched with pen-manure 1936 : remainder interplanted with Coffee. Cocoa rehabilitated, 1936.
17 A ...	2,603	290	168	489	533	4,083	13.3	33-38	15.41	1.1	Part trenched without manure, 1931 : part interplanted with Tonka Beans and Coffee, 1936. Remainder to be interplanted with the above 1937.
17 B ...	2,086	149	137	34	40	2,446	8.0	33-38	9.72	1.2	Part trenched without manure, 1931 : part interplanted with Tonka Beans and Coffee, 1936. Remainder to be interplanted with the above, 1937, both sections very poor soil.
18 A ...	2,722	251	161	148	90	3,372	8.5	13-39	22.02	2.6	Distance spacing experiment : 1 plot treated with Superphosphate.
18 B ...	2,449	172	37	—	—	2,658	7.0	13-39	19.99	2.8	No special treatment : about 6 acres of Tonka Beans and Coffee interplanted with cacao not included in acreage.
19 ...	1,301	101	66	10	70	1,548	5.1	28-39	16.88	3.3	Trenched with manure, 1934.
20 A ...	2,089	106	140	24	92	2,451	7.9	28-39	22.03	2.8	Light shade : trenched with manure, 1926 : fertilizer experiment from 1936.
20 B ...	1,361	26	38	63	69	1,557	5.1	28-39	20.54	4.0	No shade : trenched with manure, 1924 : fertilizer experiment from 1934.
20 C ...	918	13	33	17	78	1,059	3.4	28-39	9.92	2.9	Mostly no shade : old fertilizer experiment : shaded portion trenched with manure, 1936.
20 D ...	1,084	11	29	6	124	1,254	4.0	28-39	11.02	2.7	Mostly no shade : trenched with manure, 1932 : shaded portion trenched with manure, 1936.
21 A ...	1,839	96	58	221	—	2,214	7.6	28-39	30.99	4.1	Partial shade : trenched with manure, 1931-32 : fertilizer experiment from 1934.
21 B ...	1,787	156	71	582	—	2,596	8.7	28-39	13.22	1.5	Partial shade : trenched with manure, 1931-32 : part fertilizer experiment from 1934.
22 A ...	1,576	29	166	161	197	2,129	6.6	28-39	16.69	2.5	Three-quarters trenched with manure, 1935 : Completed 1936.
22 B ...	2,442	142	288	113	279	3,264	10.2	28-39	29.89	2.9	Trenched with manure, 1925 : Re-trenched 1936.
22 C ...	787	17	77	46	218	1,145	3.5	28-39	9.38	2.6	Trenched with manure, 1925 : Re-trenched 1936.
22 D ...	2,004	107	55	49	134	2,349	7.7	28-39	9.92	1.3	Trenched with manure, 1935.
22 E ...	1,050	10	30	3	123	1,216	3.8	28-39	2.03	.5	No special treatment.
23 A ...	2,399	44	61	46	208	2,758	10.1	28-39	33.94	3.3	Trenched with manure, 1934 : small fertilizer experiments from 1936.
23 B ...	804	38	56	228	90	1,216	4.4	28-39	10.29	2.3	Part trenched with manure, 1934 : Completed 1935.
23 C ...	1,330	39	61	320	438	2,188	8.1	28-39	22.02	2.7	Part trenched with manure, 1934 : Completed 1935.
24 ...	1,421	159	11	—	290	1,881	6.0	28-39	11.19	1.8	3.2 acres cut out and planted in West Indian Limes, 1936 : remaining 6 acres : interplanted with T.1 Limes late 1935.
25 A ...	963	10	2	66	123	1,164	3.9	13-34	7.89	2.0	Mulch and Fertilizer experiment.
25 B ...	2,270	106	67	179	169	2,791	9.3	13-34	29.90	3.2	Propagation, Progeny, and Colour plots : trenched with manure, 1934 Fertilized 1936.
	91,217	5,637	5,638	8,105	8,535	119,132	418.7	—	1021.12	2.63	

REPORT OF THE MANAGER—ST. AUGUSTINE NURSERY.

Plant Distribution.

The number of plants distributed in 1936 increased by 31,885 the total being 70,462 in 1935, as compared with 102,347 in 1936. Included in this total are 5,133 plants distributed free to Government Institutions in the Colony as against 3,782 in 1935.

2. A detailed list of plants, seeds, cuttings, &c., distributed is given below :—

Citrus Budded.		
Grapefruit (Marsh)	7,423	
do. (Assorted)	189	7,612
Oranges and other citrus	6,935	
T 1 Limes	745	15,292
Other Budded and Grafted Fruit Plants.		
Mangoes	2,331	
Avocados	1,709	
Cocoa	25	4,065
Seedlings.		
Limes, West Indian		6,558
Cocoa		50,974
Coffee		2,486
Miscellaneous, fruit plants		2,093
Timber trees		3,292
Other Economic plants		2,434
Decorative plants 139 boxes		15,153
Total number of plants distributed		102,347
Budwood (No. of buds).		
T 1 Lime buds	5,542	
Other Citrus buds	17,438	
Mango buds	70	23,050
Cuttings.		
Derris	27	
Dadap	125	
Other cuttings	87	239
Seeds.		
Countable		531
Miscellaneous (Pkts.)		71
Produce.		
Fruits, miscellaneous		3,086
Vegetables, miscellaneous	...24 and 104 lbs.	
Miscellaneous.		
Prepared tape (Yds.)		1,522
Leaf mould (bags)		36
Bamboo pots		258
Clay pots		111

Revenue.

4. The Revenue in 1936 was $1,373.38 more than in 1935, the increase being due to a greater demand for Mangoes, Avocados, Oranges, Cocoa, Other Economic and Decorative plants ; Grapefruit plants remaining about the same. T 1 limes were in little demand. The following list gives the revenue collected :

	$	c.
Grapefruit plants	1,961	75
Other budded and grafted plants	3,131	42
Other economic plants	1,663	53
Decorative plants	1,418	13
Produce	205	26
Miscellaneous	391	98
	8,772	07

CITRUS.

5. Orders for all grapefruit plants have been supplied, the number of Marsh distributed being 7,423 as against 7,010 in 1935. Assorted grapefruit distributed was only 189 as against 538 in 1935 being 349 less for 1936.

Oranges.

6. The demand for orange plants has increased and all orders for the Valencia Late could not be supplied but the distribution of all varieties was 1,435 more than in 1935, the total number for 1936 being 6,935 as against 5,500 for 1935.

Limes.

7. The distribution of lime plants has been restricted to 10,000 in which is included the T 1 ; a number of these were prepared but only 745 were distributed with 6,558 West Indian seedlings.

Weather.

8. The dry season for 1936 was normal from January to May, 10·86 inches of rain fell in this period. Scale (*Lepidosaphes gloverii*) continued to cause serious trouble in the budding beds. The rainy season commenced in June and until December 60·22 inches fell which was well distributed. Scale infection at the end of the year was negligible.

Sour Orange Stock.

9. Scab (*Sphaceloma fawcetti*) did not make its appearance before November and very little damage has been done to the growing points of the sour orange.

Cocoa.

10. Seedlings have again showed an increase in the number distributed, being 50,974 as against 22,690 distributed in 1935.

Avocados.

11. An increasing demand for these plants was met this year and 1,709 were distributed as against 829 in 1935, the budded variety, Pollock, being most in demand. Several orchards in the districts that are suitable for their growth have been enlarged. For the past two seasons we have been able to dispose of our fruits of this variety from our plot before the other varieties were on the markets in any quantity.

Mangoes.

12. The variety, Julie, is still being planted in larger numbers than the others, the total number of grafted plants of all varieties distributed being 2,331 in 1936 as against 1,448 in 1935.

ORCHARD PLOTS PLANTED FOR PROPAGATING MATERIAL IN 1931.

T 1 Limes.

13. The half acre block planted in July and September of 1929 gave a yield at the rate of 133 barrels per acre. The crop totalled 10,693 lb., which is 3,357 lb. over that produced in 1935. The trees had recovered from their previous attack of scale (*Lepidosaphe gloverii*) and the heavy rainfall from June (60·22 inches) put the trees in good condition. The number of buds distributed were 5,542 in 1936 as against 15,680 in 1935.

14. A new plot of T 1 Limes planted in August, 1935 commenced to bear and 888 lb. were reaped. The trees, 80 in number, are planted in 0·52 acres at 12 feet by 24 feet. The yield in barrels of 160 lb. is equivalent to 5·54 barrels per acre.

Avocados.

15. The varieties introduced through Dr. Fairchild of the Department of Agriculture, U.S.A., and planted out in 1933 have fruited. Simmonds is the only smooth skinned variety, a large pear with small stone cavity and pronounced nutty flavour. The others, Butler, Dunedin, Collinson and Winlowson are all of the Guatemala type.

16. The older trees of Pollock, Rudder, St. Ann's, River, St. Clair and Panchoi, planted in 1931 are growing well, Pollock and Rudder being the earliest fruiting varieties.

Mangoes.

17. The collection has been maintained, the trees of the large growing varieties being well developed.

Citrus.

18. Scale (*Lepidosaphe gloverii*) was again severe in the dry season but at the end of the year the trees had recovered.

19. A fruit of Tangelolo was picked in April and tested ; its characteristics are a tight skin, pink flesh, juicy, plenty of rag, sweet but insipid. Seville orange introduced through Kew has fruited this year.

General.

Mauritius Pea (Pisum Sativum).

20. This variety was again grown and seeds distributed as in previous years.

Tung Oil.

21. Trees of Aleurites Montana planted in 1931 have again flowered but produced no fruit.

Bougainvillaea.

22. Seedlings have again been obtained from the following parent plants :—

Names.	*No. of plants in beds.*
Brick Red	... 19 non declared.
Pink	... 6 do.
Lady Watts	... 16 do.
Seedling of Lady Watts	... 100 do.

23. Of the seedlings recorded in my 1935 report, two only have been selected as worth keeping for further observations, one a bright purple the other a brick red, both are free flowering.

Flowering and Ornamental Plants.

24. New introductions of interest are :—

Cupressus pyramidilis, an upright growing form.
Cynoglossum. Chinese Forget-me-not, producing large sprays of blue flowers 18 inches.
Hymenanthera. A dwarf growing yellow flowering plant, useful for borders.
Ficus Sycamorus, an evergreen shade tree.

Visits of Societies and Schools.

25. The Naparima District Agricultural Society, members of the Horticultural Society, and planters from the Fishing Pond District, Sangre Grande, visited the Nursery during the year.

Instruction.

26. The following persons attended for instruction :—six Students of the Imperial College of Tropical Agriculture ; E. Hewitt, Agricultural Officer, Paramaribo, Suriname ; and J. Grant, Trinidad.

Donors.

27. Seeds of planting material were received from the following :—Royal Botanic Gardens, Kew, England ; Department of Agriculture, British Guiana ; Department of Agriculture, Barbados ; Mrs. Ena Campbell, California ; Gaines R. Wilson, Miami, Florida ; W. R. Holloway, Australia ; Vilmorin-Andrieux & Co., Paris ; Messrs Sutton & Sons, Reading, England ; G. A. Jones, I.C.T.A. ; and Botanic Station, Tobago.

Propagators.

28. The loan of trained budders to estates continues to be appreciated, 203 days being spent away from the station for this work for the year.

F. C. BUTHN,
Manager.

ST. AUGUSTINE EXPERIMENT STATION ANNUAL REPORT, 1936.

I was on vacation leave from June 22nd to November 16th. During my absence Mr. F. C. Buthn, Manager, St. Augustine Nurseries was in charge.

Rainfall.

2. The year 1936 has been one of rather heavy rainfall. The dry season was short and not very severe, the rains coming earlier than in the previous year. Particularly heavy rain fell during June, July and August.

3. The total rainfall of 71·08 inches was considerably in excess of 1935 when 61·43 inches were recorded, and well above the average of 55·30 inches (taken over a 19-year period).

Rainfall, 1936.

January ...	1·35 ins.	July ...	10·93 ins.
February ...	0·86 ,,	August ...	10·54 ,,
March... ...	0·01 ,,	September ...	7·56 ,,
April	2·24 ,,	October ...	3·42 ,,
May	6·40 ,,	November ...	8·65 ,,
June	12·67 ,,	December ...	6·45 ,,
		Total ...	71·08 inches.

Citrus Experimental Block.

4. The greater proportion of the trees in the experimental area are now just over four years old. Except for irregular growth in certain plots of the manurial experiment, the trees have all made excellent growth, and are shaping well.

Cultivation.

5. No hoe weeding was performed, general cultivation consisted of cutlassing, rondearing, and circle forking in November before applying manures.

Application of Manures.

6. In all experiments except Experiment 6, Manurial and the Spacing trial, the modification introduced in 1935 was continued. This consisted of applying 3¾ lb. of Sulphate of Ammonia and 5½ lb. of Sulphate of Potash per tree for the year, in two applications. It is likely that this dressing will again have to be modified as the trees are now coming into bearing. The practice of applying fertilisers in August was abandoned, as this is usually a period of heavy rainfall.

Pests and Diseases.

7. Scale insects have been much less severe this year. Spraying was carried out in February and April using "Citromulsion", as well as two or three experimental preparations. No further spraying was attempted, a particularly rainy wet season not only increasing the prevalence of entomogenous fungi, but also making spraying impossible. Orange snow scale (*Chionaspis citri*) continues to give some anxiety as it appears to prefer conditions of shade and moisture. Considerable infestation was noticed on the main trunks and branches, and splitting bark was prevalent. The Entomologist to the Department has been carrying out weekly "crawler" counts on certain trees in order to study the life cycles of scale insects, and to indicate the optimum time for spraying. These counts will be continued for some time. Rust mite continues to cause damage to fruit and the problem of its control is at present receiving attention.

Windbreaks.

8. The *Tephrosia candida* windbreaks have made excellent growth and afforded good protection. In order to keep them as dense as possible the sides have been trimmed and kept from setting seed. The two main lines of Pomeracs have made fair growth and a few plants have been supplied.

General Attention.

9. Light trimming and pruning have been carried out to remove dead wood and low branches. The trunks and main branches were limewashed and the trees heavily mulched with grass in January in an attempt to decrease the harmful effects of sun and wind in the dry season.

Records.

10. Routine measurements and field records have been kept throughout the year.

Seed Testing.

11. All Marsh grapefruit trees which carried fruit were examined in March or December for seeds. Two fruits were cut from each tree and the seeds counted. In all 909 trees were examined out of a total of 1,308, leaving 399 trees to be tested next year. In no single case was a fruit found to contain as many as seven seeds and those trees tested so far may be regarded as "seedless".

Crop.

12. Eight field boxes of oranges and 139 field boxes of grapefruit were reaped from the various experiments and sent to the Central Packing Shed. Most of the grapefruit were oversized and were graded as "culls".

PROGRESS REPORT ON CITRUS EXPERIMENTS.

Experiment 1—Stocks for Grapefruit.

13. An experiment designed to test the relative merits of sour orange, rough lemon, sweet Seville, and "wild" grapefruit, as seedling stocks for Marsh grape ruit. Four selected trees of each stock are included for comparison. The trees in this block have made excellent growth and are the best for fruiting and appearance of all the experiments. It is too early yet for any results to be available from these trees.

Experiment 2—Stock Variety Plot.

14. To test the relative growth, vigour and resistance to disease of sour orange, sweet Seville, rough lemon, and "wild" grapefruit (*a*) as seedlings, (*b*) as layers, and (*c*) budded on to their own seedling rootstocks. Considerable difficulty was experienced in obtaining layered plants and even now it has not been possible to plant out all the layers required. The seedlings and budded trees have made vigorous growth.

Height of Bud Insertion.

Experiment 3—Marsh Grapefruit.
Experiment 8—Valencia Oranges.

15. To test out the best height of budding on to sour orange stock, with regard to resistance to gummosis disease. Heights of budding vary from two to twenty-five inches. All trees have made good growth, and no infection with gummosis has as yet been noticed. Height of budding has not yet any noticeable effect on the shape or vigour of the scion.

Experiment 5—Cultural.

16. To compare the effects of the following cultural treatments on the growth and yield of grapefruit ;
1. Cutlassing.
2. Cutlassing plus circle fork and dust mulch.
3. Cutlassing plus cover crop.
4. Cutlassing plus cover crop plus circle fork and dust mulch.

Stock : Sour Orange ; *Scions :* Marsh, Duncan and Foster. No manures applied between 1932-1935. First manuring, November, 1935. The trees have made remarkable growth and improved in appearance since the application of manures was introduced.

17. In treatments 3 and 4 the cover crop planted (*T. candida*) has made a good cover in nearly all plots. It was topped back to a height of two feet in October. It is inclined to be too upright in growth and produces woody stems. The trees have not yet fruited and there is little to choose between the treatments at present.

Experiment 6—Manurial.

18. A camparison of the effects on growth and yield of fruit of various combinations of organic and artificial manures.

Stocks : Sour orange, rough lemon and " wild " grapefruit.
Scion : Marsh grapefruit ; *Layout* : 4×4 Latin Square.
Main Treatments :
1. No Nitrogen.
2. Single Nitrogen.
3. Double Nitrogen.
4. Single Nitrogen plus Pen Manure.

Sub Treatments :
1. Control.
2. Potash.
3. Phosphate.
4. Potash plus Phosphate.

There are, therefore four sub-treatments to each main treatment, *i.e.*, sixteen separate treatments.

19. There are marked differences in growth between the treatments. To illustrate this point the following table shows the total average increment in girth below bud union for each treatment, the figures each representing the mean of 36 trees, *i.e.*, combined data for the three stocks, four plots of nine trees. Girth above bud union, height, and spread, although not given, very closely approximate the results of the girth below bud union.

20. It will be seen that most growth response has come from N.1+Pen Manure+P., and the least response from the no manure plots.

Average Increment of Girth Below Bud.

1933-1936 (in. cms.)

	Nil.	K.	P.	K+P
N.1+Pen Manure	29.1	30.4	31.9	31.3
N.2	20.9	28.1	21.5	25.8
N.1	19.8	28.7	19.6	27.9
No	18.3	23.8	18.8	23.5

Experiment 7—Stocks for Oranges.

21. Similar to Experiment 1 (Stocks for grapefruit), but using as scions Washington Navel, Valencia, and Pineapple oranges, each in separate blocks. The block of Pineapple oranges was planted in 1933 one year later than the other two. There is little to choose yet between the various stocks as regards growth. The rough lemons are slightly ahead and the other three stocks are about equal. As the trees are just coming into bearing it is too early to compare their yields. It is worth noting, however, that the Valencias are a good type of fruit, and that nearly all the Navels are inclined to be dry and corky. Whether or not this is merely the effects of young fruit remains to be seen.

Experiment 9—Demonstration Block.

22. This was designed purely as an object lesson to all prospective planters of citrus, to show the results of neglect and lack of manures on the growth and yield of Marsh grapefruit on sour orange. There are two plots of 28 trees each ; one plot (B.114) which receives a complete dressing of manures and normal estate cultivation ; the other plot (A.113) receives no manures at all and cultivation consists of round weeding and cutlassing twice a year. In both plots the drains are kept clean. The following table forcibly illustrates what is likely to happen if citrus trees are neglected.

GROWTH MEASUREMENTS—1933-1936.

Total Average Increment.

Treatment.	Girth Below Bud. (cm.)	Girth Above Bud. (cm.)	Height (cm.)	Average spread (cm.)
B. 114	27·0	24·5	204	291
A. 113	14·3	13·6	131	155
Difference	12·7	10·9	73	136

Yearly Costs.

23. The total cost of the citrus experiments for 1936 are given below, in comparison with those of 1935. These figures do not include capital charges or supervision.

	1935.	1936.
	$ c.	$ c.
Drain	43 39	129 13
Cutlass	185 56	341 43
Weed	372 02	—
Rondear	200 20	184 53
Circle fork	59 55	59 33
Mulching	—	56 39
Fertilisers	366 04	423 97
Pen Manure	177 43	52 62
Spraying	435 30	131 52
Supply plants	18 10	—
Windbelts	147 71	9 30
Prune	68 95	50 89
Experiment 5—Cultural	110 60	194 32
Experimental Records	247 78	199 96
Dig Para grass	411 07	—
Weed drains	—	44 10
Clear mulch	—	10 70
Lime washing	—	18 12
Reap fruit	—	26 77
Miscellaneous	18 30	33 74
Total	2,862 00	1,966 82

24. It will be seen that there has been a reduction of $895.18 compared with the 1935 costs. This is chiefly due to savings on digging Para grass, reduction in Pen Manure, economy in spraying, and other small items.

25. There are approximately 45 acres of oranges and grapefruit which give an average cost of approximately $44.00 per acre, excluding capital charges and supervision.

LIMES.

Backcrosses.

26. The young backcrosses in Field 16 have made considerable growth with a few exceptions. Some plants have died out from general weakness and some from root disease. A miscellaneous collection of lime and other citrus crosses was taken over from the Cotton Station and planted out in the southern end of the field. Further crossing was attempted during May and June in order to increase the number of backcrosses with the main object of attempting to produce a lime immune to wither-tip disease. The crosses made were as follows :—

Male.	*Female.*	*No. of flowers pollinated.*	*No. of fruit. set.*	*No. of fruit picked.*	*No. of seeds.*
T. 6	W. I. ...	11	9	1	8
W. I.	T. 6 ...	6	2	—	—
T. 1	W. I. ...	31	19	8	65
W. I.	T. 1 ...	17	10	—	—
T. 166	W. I. ...	17	12	4	2
W. I.	T. 166 ...	8	6	—	—
T. 145	W. I. ...	6	5	1	12

27. Actual pollination work was left rather too late and although a fair proportion of fruit set, heavy rains and moist conditions seriously affected the growth of the set fruit. The largest proportion of successes was with T. 1 (male) and W. I. (female). The seeds were planted out in November.

Juice Testing.

28. Certain complaints of the lack of juiciness of T. 1 limes, when picked for the green lime trade, have been received. The general opinion is that there is a critical period which lasts for only a short time, when T. 1 is green and juicy and consequently fit for shipping. In order to test out this theory weekly juice testing experiments were started in June and are continuing. A sample of 20 West Indian and 20 T. 1 limes has been picked each week in a condition as near as possible to green limes. Each sample is divided into two and weighed. The juice is then expressed, weighed, and the volume of juice recorded. It is hoped that by using West Indian limes as a basis it will be possible to trace if there is any fluctuation in juiciness of T. 1 limes during the season.

DISTRICT CITRUS MANURIAL EXPERIMENTS.

29. During February and March a series of fertiliser trials were initiated on various citrus estates in the island. They were the outcome of recommendations made by Professor F. Hardy, of the Imperial College of Tropical Agriculture, and they were originally financed out of a special vote. Their object was to test and compare applications of ground limestone and Potash, alone and in combination. Seven trials in all were laid down at Macqueripe, Santa Cruz, Aripo, Tamana, Maracas and McBean. Young non-bearing trees of Marsh grapefruit were used at varying ages from 1½-3½ years old. A complete fertiliser trial was laid down at Erin Estate where the lime status of the soil most nearly approximates that of St. Augustine. In December another trial was laid down at Arima on young trees. Limestone, Potash and Phosphate are being tested alone and in combination.

30. I should like gratefully to acknowledge the help and co-operation of the owners and managers of the estates on which manurial experiments have been laid down

SUGAR CANE.

Variety Trials.

31. Early in the crop season the reaping and further working of all estates variety trials was taken over by the Sugar Agronomist who arranged for their reaping.

32. The results of the 1936 trials were duly reported and circulated to all sugar estates.

Multiplication of New Varieties.

33. Plots of new cane varieties received from the Plant Quarantine Station at the end of 1935 and during 1936, have been established in Fields 15 and 19. They consist of a wide range of cane types from the thick noble Barbados varieties to the thin wild canes of Coimbatore, India. Thirteen new varieties have been received and of these 15 were distributed between June and September to various sugar estates.

Cane Crop at St. Augustine.

34. The 1936 cane crop consisted of 117 tons, which was about 30 tons more than last year, owing to a new area of plant canes.

MINOR CROPS.

Pigeon Peas.

35. Three plots of selected pigeon peas were reaped in February and from each plot 64 plants were selected at random. The crop from each plant was counted and the weight of dried peas obtained. Planting distance was 4 feet by 4 feet. Results were as follows :—

Plot 1—Lasiba No. 5/276, Yield 45 lb. 5 oz. (725 oz.) Mean of 64= 11 oz. per plant.
Plot 2—Lasiba No. 1/276, Yield 38 lb. 9 oz. (617 oz.) Mean of 64= 10 oz. per plant.
Plot 3—Tobago No. 27/293, Yield 49 lb. 1 oz. (785 oz.) Mean of 64= 12 oz. per plant.

36. The total yield of dried peas from the whole of the three plots was 894 lb. giving a yield of 993 lb. of dried peas per acre. It is doubtful whether such high yields have been obtained before in Trinidad. Further selections were planted in July, but heavy rains have made the growth very uneven.

Cover Crops.

37. Small plots of all available cover crops were planted in order to keep up stocks of seeds. The demand for these seeds is very erratic, and it is extremely difficult to know which varieties will be most in demand.

Cassava.

38. The following varieties were grown and kept for stock :—
Bitter Cassava : Sellier, Parasol, Turkey Claw, Mama l'Enfant.
Sweet Cassava : White Stick, Black Stick.
There is practically no demand for planting material.

Banana Collection.

39. The collection of local varieties was cut out during the year as it was found that conditions at St. Augustine were not suitable for their growth.

Ground Nuts.

40. Ten selected varieties of ground nuts were received from the Plant Quarantine Station and have been planted out. These varieties come from the Central Provinces of India and are all improved strains.

Stock.

41. At the end of the year an aged ox " Silver ", valued at $38.00 was exchanged for a young ox valued at $60.00 and the difference of $22.00 was paid out of the stock vote.

42. A new concrete post and wire fence has been erected round the pasture and three pairs of new gates built.

43. Mules and oxen have been maintained in good health throughout the year.

St. Augustine Rice Lands.

44. The 13 acres comprising the St. Augustine rice lands were again rented to the same tenants as last year.

REVENUE 1936.

	$	c.
Cane and cane plants	310	05
Grapefruit	13	60
Oranges	2	44
Bananas		74
Cover Crop	73	05
Miscellaneous	84	31
Total	$ 484	19

EXPENDITURE 1936.

	Expenditure.	Savings.	Total Vote.
	$ c.	$ c.	$ c.
Personal Emoluments, Manager ...	2,160 00	—	2,160 00
Field Assistants	1,320 00	—	1,320 00
Other Charges			
Maintenance, Materials ...	2,599 83	40 17	2,640 00
Cultivation	4,101 06	1,178 94	5,280 00
Stock	559 24	64 76	624 00
Total	10,740 13	1,283 87	12,024 00

E. J. GREGORY,
Manager.

REPORT OF THE CURATOR, ROYAL BOTANIC GARDENS.

Royal Botanic Gardens, Government House, St. Clair, Queen's Park, St. Ann's and Mendez Savannahs and Red House.

Royal Botanic Gardens.

I assumed my duties as Curator on April 21st, 1936.

General.

2. The Gardens throughout the year were well maintained ; the general watering of plants was restricted during the dry season, and sections of the Gardens suffered damage.

3. Increased labour was detailed to the care and maintenance of lawns, with the result that attacks of mole-crickets and chinch bugs were rare ; while minor outbreaks were overcome by frequent heavy rolling of the turf.

4. On several occasions heavy rainfall caused damage to the roads ; principal roads and paths have been resurfaced.

5. A section of the Look Out Hill has been cleared to establish an avenue of *Cassia fistula*, terminating at the Ceylon Willow Tree with *Bougainvillaea Mrs. Mc Clean.*

6. Special attention has been given to the formation of vistas ; overcrowded sections have been cleared and turfed, emphasizing the natural sweep of the lawns.

7. A portion of the recently purchased land North-east of the Nursery has been developed to accommodate Palms for decoration purposes ; a hedge of *Murraya exotica* has been planted to enclose it.

8. The concreting of the main culvert has been extended to the Ceylon Willow Tree ; the old concrete bridge has been removed and replaced by one of a rustic design made from local hardwoods.

9. A three-compartment concrete Solar Propagator has been erected in the Nursery.

10. Ninety-six new lead 'Spelter' Garden labels were imported, eighty-two labels were cleaned and repaired. Six Garden seats have been repaired and positioned in the grounds.

11. Two 'Wardian' cases of plants were received safely from the Royal Botanic Gardens, Kew ; new types of *Anthuriums* were introduced together with collections of ornamental shrubs ; of special mention are :—*Aphelandra* spp., *Allamanda violacea, Rhododendron javicum* vars., and *Manettia inflata.*

12. Seven young plants of *Amherstia nobilis* were vegetatively propagated during the year ; various methods of layering were employed, the wire 'constriction method' was found to give the most successful results.

Flower Garden.

13. The renovation work of the Bandstand and ornamental flower stands was attended to by the Public Works Department.

14. Displays of annuals were represented during the year ; good results were obtained principally in the wet season with :—*Zinnia elegans* vars., Balsams, Marigold Guinea-Gold, *Celosia cristata* and *Amarantus bicolor.*

15. Several new introductions were planted in the large round beds ; the following deserve special mention :—*Allamanda cathartica grandiflora, Begonia gracilis* vars., and *Manettia inflata.*

16. A small trial bed was planted with the newly introduced American rose Editor Macfarlan ; the feature of this variety is its floriferous habit, but a tendency to produce a high percentage of semi-double flowers was noticed.

GOVERNMENT HOUSE GARDENS.

17. The grounds surrounding His Excellency the Governor's Residence have been well maintained ; constant use of the motor lawn mower resulted in the good condition of the lawns.

18. A considerable amount of renovation work has been made, particularly in the Lady Chancellor's Garden and the Tennis Court area ; portions of the *Murraya exotica* hedge have been removed and the area turfed. Overgrown shrubs have been replaced with subjects of a more attractive nature, of special mention are :—*Hibiscus Rosasinensis,* varieties Charlotte, Lady Betty and Sunset, *Pentas coccinea* and *Canne indica* varieties.

19. The aquatic plants in the Lily tank have now become established ; *Nymphaea zanzibariensis* and *Nymphaea Rudgeana* flowered freely ; excellent results were obtained with *Victoria Regia,* and at one time it completely filled the surface of the pond.

20. The large specimen of *Cynometra trinitensis* was blown down during the storm of July 11th.

Vegetable Garden.

21. Experimental plots of introduced Melons and Dwarf Beans were made and reported upon.

St. Clair.

22. The area surrounding the Head Office has been well maintained, and the lawns regularly mown.

23. Fifteen reinforced concrete flower pots were purchased to accommodate the ornamental palms on the Verandah.

Trees on Government Lands.

24. Regular attention was given to all trees under care of the Department during the year.

25. Attention was given to trees, on reports from the Public Works Department, at the following Institutions :—

The Colonial Hospital.
The Government Analyst Department.
The Government Printing Office.
Queen's Park Savannah.

Red House and Audit Office Grounds.

26. Areas surrounding the Magistrates' and Tuberculosis offices have been regularly attended to; the overgrown *Hibiscus* hedge has been removed and replanted.

27. The Flagstaff lawn suffered badly during the year from attacks of mole-crickets; a carbon bisulphide emulsion was applied over the whole area during the early stages of the attack, this remedial measure was unsuccessful, and the usual method of applying diluted disinfectant was resorted to.

28. The area of bare lawn surrounding the *Mimusops elengii* trees has been planted with *Panicum trigonum*; this grass proves to be highly suitable for planting in situations under dense shade.

29. Thirty-two new reinforced concrete pots were purchased and planted with palms; these have been positioned inside the Entrance Hall, Rotunda and Eastern Verandah. Six specimen palms have been planted out in tubs on the lawns by the Main Entrance; the plants can now be changed periodically with little or no disturbance.

30. The Department gratefully acknowledges the many donations from abroad and from local sources of plants and seeds :

Abroad—

W. R. Holloway, Esq., Australia.
United States Dept. of Agric., Florida.
David Barry, Esq., Los Angeles.
B. Baxter Esq., Brazil.
The Atkins Institution of the Arnold Arboretum, Cuba.
Botanic Gardens, Dresden, Germany.
Royal Botanic Gardens, Kew, England.
Messrs. Woodlawn Park Cemetery Co., Miami.
Messrs. Vilmorrin Andrieux et Cie., Paris, France.
Department of Agriculture, British Guiana.

Local—

Geo. F. Huggins, Esq., O.B.E.
W. M. Dickson, Esq.

R. E. DEAN,
Curator, Royal Botanic Gardens.

GOVERNMENT STOCK FARM, TRINIDAD.

General.

More interest was taken in livestock throughout the colony during the year, due, no doubt, in the first place to better prices being obtained for agricultural products, and secondly to the fact that fewer cases of Paralytic Rabies have occurred than during the past two years.

2. The Department has decided to carry out extension work by standing breeding units for service in outlying districts in the colony for a period of two months. Each unit will consist of a Jack Donkey for mule and donkey breeding, a Holstein Friesian Bull, a Buck goat (dairy type) and a boar. To this will be added a thoroughbred stallion when required. Two such units are ready to start these operations early in 1937, the service fees have been reduced on the recommendation of the Nutrition Committee as follows :—

	Old Charges.	*New Charges.*
	$ c.	$ c.
Thoroughbred stallion	10 00	10 00
Jack Donkey to a mare for mule breeding	7 50	4 00
Jack Donkey to a Jenny	1 00	1 00
Pure bred Holstein bull	2 00	1 00
Pure bred Zebu bull	1 80	1 00
Grade bulls	1 00	75
Pure bred Buck (dairy goat)	1 50	75
Pure bred Ram (sheep)	1 00	75
Pure bred Boars	1 50	75

3. The final step to be taken is to have Jack Donkeys, Bulls, Buck Goats, and Boars permanently stationed in every district of the colony where they are required, and an application has been made through the Nutrition Committee for funds to import six young dairy bulls and six British Alpine bucks in 1937 and 1938 to assist in carrying out such a programme.

4. A Livestock Exhibition in Port-of-Spain was organized by the Agricultural Society from 30th October to 1st November, and the Farm was allotted a small section on the grounds for their exhibits, which were not for competition.

5. The following were the livestock from the Government Stock Farm at the Stock Show :

Horsekind :

3 Thoroughbred Stallions (Young Native, Bachelor's Tut and Knight of St. Patrick).
1 Kentucky Jack Donkey (used for mule and donkey breeding).
1 Pure bred Kentucky Jenny and Jack foal (by the imported Kentucky Jack).
1 Three-quarter bred Kentucky Jenny and seven-eighths bred Jenny foal (by the imported Kentucky Jack).
1 Half bred Kentucky Jenny and three-quarter bred Jack foal (by the imported Kentucky Jack).
1 Ordinary small jenny and half-bred Jack foal (by the imported Kentucky Jack).

Cattle :
The pure bred Holstein Friesian Bull " Sir Inka May 45th ", imported from the Carnation Farms, Seattle, Washington (1935).
Pure bred Zebu Bull and Heifer.
Pure bred Sussex Cow and pure bred Heifer calf.
Goats :
British Alpine goats—pure breds and grades (dairy breed).
Indian Goats (mutton breed).
Sheep :
Blackhead Persian sheep.
Pigs :
A Boar and a Sow of Large Blacks and Berkshires.
Poultry :
A trio of Rhode Island Reds, Barred Plymouth Rocks and White Leghorns.

6. The attendance at the Livestock Exhibition during the three days was very good, and there was also a much larger crowd at the Annual Sale at the Stock Farm which was held a month later—5th December—than in 1934 or 1935.

7. The rainfall was heavy, 71.08 inches as compared with 61.34 inches in 1935 and 47.02 inches in 1934. The driest month was March, ·01 inches, and the month with most rain June, 12·67 inches. The rainfall in the Maracas Valley was even greater, and the St. Joseph River overflowed its banks causing considerable damage to the road leading through the Farm to the St. Augustine Experimental Station and the Nursery.

8. With the exception of the period March to the middle of May, the pastures were green throughout the year. It was necessary to cut only part of our Uba cane for fodder as the supply of bulky food from the grass fields and our cane tops were sufficient to meet the demands. The Constabulary were supplied throughout the year—even at the driest time—with grass.

Water Supply.

9. No difficulty was experienced with the water supply from the Blakes Ram in the St. Joseph River during the year, the improvements made by the Public Works Department in 1935 proving quite satisfactory. The Engineer of the Central Water Board prepared an estimate for laying new pipes on the Farm from the Central Water Supply during the year. This extraordinary expenditure has been approved and the work will be carried out early in the year.

Cattle.

10. The following animals, born since our last registration in the Herd Book of the Agricultural Society were registered during the year :—

Pure Bred Holsteins	3
Pure Bred Sussex	3
Pure Bred Zebu	1
Grade Holsteins	36
Grade Sussex	1
Zebu Foundation	17
	61

It has been decided to tattoo our calves at birth on the inside of the ear, and to use only the brands of the Agricultural Society in the future which are also to be given as markings at our annual sales.

11. During the year the Stock Farm received as a gift from Mr. C. W. H. Glossop a pure bred Holstein Friesian Bull calf " Lund Superblanche Julius 2 " from his well-known " Lund " herd, Doncaster, England. Sometime ago Mr. Glossop visited the Stock Farm and promised to send a bull calf out as soon as a suitable one was available. The animal was shipped by the Crown Agents through the Laboratory of the Ministry of Agriculture and Fisheries, Weybridge, where it was immunized against Piroplasmosis before shipment. The Department is indebted to Mr. Glossop for his magnificent gift.

12. The pure bred Holstein Friesian Bull calf " Sir Inka May 45th ", which was imported last year from the Carnation Farms in the United States of America, got over his natural immunization against Red Water Fever quite successfully, and is now thoroughly acclimatised. His fertility was tested when a year old by breeding him to a few selected heifers, and later on in the year his services were increased to include the pure bred cows on the Farm, as well as a few selected heavy milking grade cows.

13. The pure bred Holstein Friesian Bulls " Lowlands Chief ", " Rutgers 2 " and " Prince Johanna Hartog " were kept for service at the Stock Farm : three pure bred Bulls of the same breeding were stationed at the Government Service Station at Mucurapo, one was sent to Siparia for a short time, one to the Arima district at La Toricella Estate, and another stood for service at River Estate throughout the year. The pure bred Holstein Friesian Bull " Segis Echo Rooker " was handed over to the Ste. Madeleine Sugar Company in exchange for the pure bred Zebu Bull " Sultan ". Two young pure bred Holstein Bulls were sold at the Annual Sale at an average of $64.00 each.

14. The selected grade (Zebu-Holstein) Bulls " Baldwin " ($\frac{3}{4}$ bred Holstein) and " Champion " ($\frac{1}{2}$ bred Holstein) were used on the $\frac{3}{4}$ bred and $\frac{1}{2}$ bred herds, respectively, during the year, but the 7/8 and higher grades were bred to pure bred bulls, as there were no suitable grade bulls available for this special breeding.

15. A pure bred Sussex Bull calf was landed in the colony in October in transit to St. Lucia for that colony's Government, and was kept at the Farm to develop his natural immunity against Piroplasmosis. He has become protected without developing any serious symptoms and will be sent to St. Lucia early in the new year.

16. The small Sussex herd has been maintained separately, as in the past. The two pure bred bulls in Tobago stood for service at the Farm, Studley Park, Kendal and Lowland Estates. One of the pure bred cows had to be destroyed as she reacted to the Tuberculin test, but two pure bred heifers have calved during the year, and a third will be calving early in 1937. The number of pure bred Sussex cattle on our strength at the end of the year was as follows :—

3 Bulls ; 3 Cows ; 1 Heifer ; 1 Heifer Calf ; 1 Bull Calf.

17. Grading with Sussex Bulls on beef type cows and heifers has been continued, and at the end of the year the number of these grade cattle was classified as follows :—

2 Bulls ; 3 Cows ; 5 Heifers ; 3 Heifer Calves ; 1 Bull Calf.

It is hoped to send over to Tobago during the new year some of these grade bulls for distribution in outlying districts.

18. The Zebu cattle were again divided into three lots—Dairy Zebus, Working Zebus and Zebu cows for grading purposes with Holstein Friesian Bulls.

19. The heifers and heifer calves of the Milking Zebu Herd are now handled daily by keeping them tethered in a part of the coconut plantation. They respond to this form of management by becoming less excitable, and it is expected that with selection together with this form of handling, they will do better as dairy cattle. The cows of this herd all have their calves removed at birth, and massaging and milking before calving were again carried out with these cows, as well as all the cows in the dairy herd.

20. The Zebu bull "Chintaman" was used on the cows in this milking herd, and a specially selected young bull is now being reared to take his place later on. The pure bred Zebu bull "Naipall" stood at the head of the working Zebu herd for most of the year, but he died following an injury to his cranium due to a fall. His place was taken by the Zebu bull "Sultan", and a son of his being reared to take his place. For the grading work with Holstein Friesian bulls, the pure bred Holstein Friesian bulls "Prince Johanna Hartog" and "Lowland Chief" were used chiefly on Zebu cows.

21. The Zebu bull "Barandat" was transferred to Tobago early in January, and the following important sale was carried out to the Cayenne Government, there being no local demand for these cattle :—

4 Bulls : 1 at $250 00	
3 at $200 00	$ 850 00
4 Heifers at $100 00	400 00
	$1,250 00

22. The Zebu bulls and Grade bulls have again been worked throughout the year with satisfactory results.

23. Forty-one privately owned cows were bred to pure bred and grade bulls during 1936 (31 to pure bred Holstein Friesian bulls, 8 to pure bred Zebu bulls and 2 to grade bulls) in addition to Government Farm cows. The revenue derived from this source was $71.90.

24. Three pure bred Holstein Friesian bulls and there specially selected grade bulls of the same breeding stood for service at the Bull Service Station at Mucurapo for the dairying districts around Port-of-Spain during the year. One of the pure bred bulls was turned out in the Mucurapo Pasture every evening and removed the following morning. Two hundred and forty-two cows were bred to these bulls at the Station during the year, and the Farm received $240.00 for the services of these bulls.

25. An average of 76 head of cattle was pastured in the Mucurapo Pasture during the year, made up as follows :—

Cows	..38
Heifers	..35
Heifer calves	.. 3

26. At the Annual Sale on the 5th December, 17 grade heifers averaged $53.00, 3 grade bulls $59.00, 2 Zebu heifers $60.00, 2 pure bred Holstein bulls $64.00 and 2 Zebu bulls $200.00.

27. The dairy herd produced 40,520 gallons of milk, about 4,500 gallons more than in 1935. The two best records were from two grade cows (half bred Holstein Friesians) "Belle" and "Nymph", the former gave 13,068 lbs. in 468 days, and the latter 10,871 lb. in 332 days. The Public Institutions were supplied with 35,234 gallons, and the revenue received for the sale of milk was $20,143.15. Each cow's milk was weighed twice daily, and the weekly total transferred to a record book.

28. During the year 86 cows calved normally and 11 aborted. All cows heavy in calf were stabled and their udders massaged and stripped twice daily before calving. A killed Abortus vaccine (formalised) imported from the Institute of Animal Pathology, Cambridge, was used during the year on the herd and all aborting cows segregated for two months from the herd.

29. There were no cases of Paralytic Rabies on the Farm during the year and no cases of Anthrax : the animals were all vaccinated against these diseases, as well as tuberculin tested three times during the year. There were six reactors to the tuberculin test, two at each testing, and the reactors were all destroyed. Thirty-three deaths occurred during the year, and the chief causes were as follows :

6 Gastro Enteritis (young stock).
3 Old age and debility.
4 Tympanites.
2 Parturition complications.
2 Pneumonia.
2 Peritonitis.
3 Weakness and debility (calves).
3 Result of accidents.

Horsekind.

30. The brown horse "Young Native" (1929) by Junior out of Molusca by St. Frusquin was purchased during the year from the British Bloodstock Agency at a landed cost of £425. "Young Native" won nine races in England valued at £4,194 including the Newbury Spring Cup, £1,420, over a mile. A splendid opportunity was afforded to show him, as well as the other stallions during the Livestock Exhibition, where he was much admired. "Young Native" will stand for service on the Trinidad farm in 1937, and will probably be sent to Tobago later in the season.

31. The movements of the three other thoroughbred stallions during the 1936 season were as follows :—

Nelsweep	—Tobago, February-March.
	Trinidad (Farm), March-December.
Bachelor's Tut	—Trinidad (Cedros), February-March.
	Trinidad (Farm and Chaguanas) April-December.
Knight of St. Patrick (K. P.)	—Trinidad (Farm), February-March.
	Tobago (Farm), April-October.

Knight of St. Patrick was returned to Trinidad from Tobago at the end of October for the Livestock Exhibition. Thirty-four mares were served to these stallions during the time they were stationed in Trinidad and they served as well eight mares belonging to the Farm.

32. The imported Kentucky Jack Donkey stood for service during the year at Hindustan Estate (Princes Town district), at Salybia Estate (Toco), and at the Farm. His services were as follows :—

	Mares.	*Jennies.*
Hindustan Estate	2	1
Salybia Estate	2	1
Stock Farm (Trinidad)	7	6

The imported Missouri Jack Donkey " Emperor 2 " stood for service at the Farm throughout the year and so did the young Jack Donkey (foaled in June, 1934) " Jackie "—these two donkey stallions served nine mares and eight jennies from outside and two mares and two jennies on the Farm strength. Jackie is growing into a splendid type of donkey, and it is pleasing to record that our three jack donkeys all serve both mares and jennies. The jack donkey " Big Six " was transferred to the Tobago Farm in January for donkey breeding. The revenue derived from the service of stallions (horses and donkeys) during the year was $487.50.

33. The following thoroughbred brood mares foaled during the year : Barbara, a filly foal by Knight of St. Patrick ; Miranda and First Offence, colts each by Nelsweep. The last two mares foaled small and weak foals late in the season and they both died. The Barbara filly by Knight of St. Patrick was sold at the Annual Sale for $187.00. The thoroughbred brood mares Saturnia and Eastern Flower failed to hold and were bred to Bachelor's Tut. Miranda, Barbara and First Offence were all bred again during the year, but the last two did not hold as well as Eastern Flower.

34. The half bred mares Cowbell and Wistaria foaled a colt and a filly, respectively, by Knight of St. Patrick during the year. The colt fetched $297.00 and the filly $50.00 at the Annual Sale. The old mare Nellie died during the year, heavy in foal to K. P., following an attack of Staggers, and the mare Valerian aborted a filly foal by Nelsweep, following an accident. The Canadian mare Vitalia, transferred from the Constabulary, foaled a filly by Nelsweep and this is to be handed over to the Constabulary. The Constabulary mares Blarney and Moruga failed to prove and were re-bred to Nelsweep as was Valerian. The mares Vitalia and Wistaria were bred to the jack donkey this year. Cowbell was bred to Bachelor's Tut, but did not appear to be in foal at the end of the year.

35. Donkey breeding continues to be successful, and a pure bred jenny as well as a half bred jenny both foaled jack foals during the year. Besides the three jack donkey stallions on the Farm strength at the end of the year, there were also two pure bred jennies with pure bred jack foals, a ¾-bred jenny with 7/8 jenny foal, a ½ bred jenny donkey with ¾ bred jack foal and a common jenny with a ½ bred jack foal. All these jennies were bred to the imported Missouri Jack and were heavy in foal at the end of the year. The four jack foals were weaned at the end of the year and turned into a paddock with a six months old filly. These young jack donkeys will be sent out to country districts as soon as they are ready for service.

Pigs.

36. The Department is indebted to Dr. John Hammond of the School of Agriculture, Cambridge, for selecting two Large Black gilts in pig for the Stock Farm. These two gilts arrived in the colony in May and farrowed one in June (5 boars and 3 sows), one in July (9 boars and 2 sows). Two Berkshire gilts were also specially selected for the Farm by the Canadian Agricultural Department, and they were landed in February. One gilt farrowed 6 boars and 2 sows in February, but the other was not in pig. She was, however, bred soon after her arrival and farrowed 4 boars and 2 sows during the year.

37. At the Annual Sale 28 young pure bred pigs (14 Large Blacks and 14 Berkshires) realised $292.75, an average of approximately $10.50 per head. Highest prices paid were $25.00 and $20.00 for 2 Berkshire boars, respectively. The private sale of young pigs during the year amounted to $542.50, making a total of $835.25 for the year.

38. During the year, besides the Farm sows, 15 sows were bred to the pure bred boars, and the revenue received from this source was $18.75.

Dairy and Mutton Goats.

39. The British Alpine goatling " Didgemere Delmoney " purchased by the Officer in Charge during his leave in 1935 from Mrs. Arthur Abbey of Roydon, Essex, was landed in the colony in May. This goatling was not in kid, but was bred later on to the imported buck " Boddington Whisk " and was heavy in kid at the end of the year. The last two imported (1935) bucks " Didgemere Snapdragon " and " Boddington Whisk " are now thoroughly acclimatised, and they were well patronised during the year, 63 goats being bred at the Farm besides the Farm does. The revenue from these services was $86.25.

40. During the year the imported British Alpine doe " Didgemere Diabolo ", with 2 kids (a buck and a doe), was purchased from Dr. J. A. Lyon of Port-of-Spain.

41. The progeny of the first importation of British Alpine goats (2 bucks and 1 doe) in 1932 continues to increase, and all the does and goatlings were bred during the year to the imported buck " Boddington Whisk ". At the end of the year the imported British Alpine goats and their progeny on the Farm were as follows :

6 Bucks ; 7 Does ; 3 Goatlings ; 1 Doe kid.

42. The work of grading up with these imported bucks on selected Saanen does and the daughters of Waddington Watchman, imported from Barbados, has been continued, and at the end of the year it was possible to sell 12 very nice grade British Alpine females, and at the same time to select for the Farm for future breeding on these lines, some good does, goatlings and kids.

43. During the year British Alpine bucks stood for service at Port-of-Spain, Sangre Grande, Manzanilla and Tobago, as well as at the Farm.

44. At the Annual Sale twelve dairy female goats were offered and they fetched $247.70, the highest price was $41.00 for a 2-year old doe.

45. Some difficulty has been experienced in continuing our breeding work with Indian goats (mutton type), as the two available bucks for breeding purposes during the year have both proved to be sterile. An attempt will be made to obtain a fertile buck from Tobago, failing which it may be necessary to import Anglo-Nubian bucks for mating to these goats. No Indian goats were offered at the Annual Sale.

Blackhead Persian Sheep.

46. There was little demand locally for these sheep. A ewe and ram lamb were sold to Lowlands Estate, Tobago, a ewe to Forres Park Estate and another was ordered by Mr. de Meillac for Mayaro and this was ready for delivery at the end of the year.

47. Only three sheep were sent to the Blackhead Persian Ram during the year. The results obtained in Tobago by crossing these sheep with African Woolless sheep are so successful that it would be advisable for this work to be carried out on the large coconut plantations, where flocks of sheep are usually maintained.

Poultry.

48. Two White Leghorn Cockerels and four pullets were imported from the Black Lake Farm, Egham, Surrey, during the year (August). The results obtained by crossing the two original imported cocks (one of which is still alive) on Canadian pullets and hens were so successful that it was considered advisable to get down not only cockerels but four pullets as well, in order to keep the strain pure.

49. Two Rhode Island Red cockerels and four pullets, as well as a similar number of Barred Plymouth Rocks, were imported from Canada through the Poultry Division of the Agricultural Department, and landed in the colony in December in time for our hatching season.

50. Our hatching season (1935-1936) was quite successful as far as White Leghorn and Barred Plymouth Rocks were concerned, but the Rhode Island Reds laid fewer eggs than normal and great difficulty was experienced in rearing the chicks.

51. Our breeding pens for 1936-1937 season were again made up in November, and the first batch of chicks was hatched at the end of that month. The chicks are reared on wire until 8 weeks old when they are placed in runs.

52. Our breeding pens were broken up at the end of March, and from then until November only infertile eggs were sold.

53. At the Annual Sale 40 lots of pure bred poultry (80 birds) and 8 lots of Muscovy Ducks (24 birds) were sold for $380 the best prices obtained were as follows:—

Trio White Leghorns	$18.50
do. Barred Plymouth Rocks	16.25
do. Rhode Island Reds	14.25
do. Muscovy Ducks	8.00

54. The number of eggs laid during the year was 4,011, most of which were used for hatching purposes. The revenue derived from the sale of eggs was $86.81.

55. Eight new poultry runs were erected—each containing a sleeping and a laying pen—by the Public Works Department during the year.

Sale of Stock.

56. The Annual Sale was again held on a Saturday, 5th December, and as already reported it was very well attended.

57. The Sale was conducted by the Officers of the Farm, and the amount realised was $3,171.00, almost $1,200 more than last year. Private sale of stock amounted to $2,052.74, making a total of $5,223.74 for the year.

Pasturage and Stabling.

58. There was plenty of grazing at the Farm during the year for our own stock, as well as stock from outside sent for breeding purposes. The latter consisted chiefly of cows and heifers for Zebu and Holstein Friesian bulls, and mares for breeding to the jack donkeys. The stabling accommodation for mares were all made " bat-proof " by the Public Works Department this year. Goats sent here for breeding purposes and a few sheep and sows were also stabled. The dues received under this head was $1,276.25.

Sugar Cane.

59. Crop was started on 13th March, ended on 23rd April, and the cane was supplied to the Imperial College of Tropical Agriculture (478 tons), and Orange Grove Estate (207 tons), making a total of about 685 tons. The revenue derived from the sale of canes was $1,926.30, over $1,000.00 more than last year. During the year 13 acres were planted in B.H.10(12) of which 9 acres will be reaped in 1937, as well as 4½ acres " stand over " plants planted in 1935. It is estimated that our cane crop for 1937 ratoons and plant canes, all of which have done extremely well, will yield about 1,000 tons.

Uba Canes.

60. No more Uba Cane was planted this year as there was no necessity to cut all our fields. The two acres planted in 1935 were cut during the year and these ratoons as well as the old ones have all grown well. The rains continued well into December, consequently grass was fed up to the end of the year, and with the Uba on hand there will be no shortage.

Grass Fields.

61. There was a good supply of grass from our cultivated fields which are regularly manured. It was possible to keep up all outside orders for grass (Constabulary, Alston & Co., &c.) even during the dry season—this demand has at times to be met with cane tops or Uba cane chop chop. Para grass was again cut from ravines and spread over the pen manure on the fields in order to establish more of this grass on them. Demerara Primrose has been maintained along the main buildings in two patches to supply the poultry with their green fodder. The revenue derived from the sale of fodder during the year was $2,018.33.

Coconuts.

62. The practice of cutting the grass beneath the coconuts and manuring the area regularly has been stopped as far as two coconut areas are concerned. Instead of this stock is tethered out in one, and the other has been enclosed as a pasture in which stock are turned out. The yield from the coconut trees was much better this year, and the revenue from the sale of coconuts was $128.84.

Improvements and Repairs.

63. A Pasteurizing Plant and a new Milk Cooler were imported from Messrs. J. & E. Hall, England, through their local agents, Messrs. C. H. Hayward, and installed in the Dairy. The Cooling Room as well as the Engine Room were painted during the year. The Public Works Department made the stables for accommodating brood mares at the Farm " bat-proof ", and, as already mentioned, erected 8 new fowl runs.

Educational Work, Visitors, &c.

64. The post-graduate and diploma students of the Imperial College of Tropical Agriculture visited the Farm, the former on one of their field outings and the latter in connection with their practical classes during the year. The Sanitary Inspectors taking their examination in this centre for the West Indies visited the Farm for their practical demonstration. Educational visits were also paid by the Tacarigua E. C. School, Picton C. M. School, Reverend Father Murphy and children from Oropouche R. C. School, 16th Port-of-Spain Rover Scouts and the Wesleyan Sunday School children from San Fernando.

65. The following were among the visitors during the year:
The Permanent Under Secretary of State and Lady Maffey.
His Excellency the Governor of Trinidad and Lady Fletcher.
The Minister of Agriculture, Venezuela.
The Governor of the Leeward Islands and Lady Lethem.
The Colonial Secretary and Mrs. Seymour.
The Deputy Colonial Secretary and Mrs. Nankivell.
The Inspector General of Constabulary.
The Resident Engineer of the Central Water Scheme and Mrs. Riddel.
The Administrator of St. Lucia and Mrs. Baynes.
The Chief Medical Officer of Grenada.
The Government Veterinary Surgeon of Barbados.
The Commissioner of Agriculture for the Windward and Leeward Islands.
The Honourable Captain A. A. Cipriani and visitors from Columbia.
The Honourable T. M. Kelshall.
The President of the Agricultural Society.
Mr. C. W. Fleming.
The Honourable F. Seaford of British Guiana.
The Honourable Dr. A. H. McShine.

Revenue.		Expenditure.	
	$ c.		$ c.
Sale of Stock	5,238 74	Personal Emoluments	3,960 00
Sale of canes	1,926 30	Maintenance	11,692 59
Sale of Milk and eggs	20,229 96	Gatekeeper, Trinidad Government Railway	120 00
Stud Fees	915 40	Travelling	68 30
Pasturage and Stabling	1,276 25	Motor Lorry Expenses	1,145 45
Miscellaneous	2,383 48	Expenses of Annual Sale	113 56
		Grass Land Experiments	143 95
		Materials	1,660 79
		Stock—Purchase	6,160 00
		do. —Feed, purchase of	6,953 37
		do. —Expenses of Stallions ..	714 62
	31,970 13		32,732 63

H. V. M. METIVIER,
Officer-in-Charge, Government Farm.

REPORT OF THE VETERINARY DIVISION, 1936.

General.

It was definitely decided during the year to station the Veterinary Officer (Mr. M. D. Lumsden, B.V.SC.), formerly posted in Tobago, permanently in Trinidad, owing to the increase of veterinary duties.

2. Following a petition from Tobago, another veterinary appointment was made in the island ward and it was offered to and accepted by Mr. T. A. des Iles, B.V.SC. (Ontario). This officer arrived in the colony, from Canada on 4th November and, after being attached to this Division for routine duties for 5 weeks, proceeded to Tobago on the 8th December to take up his appointment as Veterinary Officer.

3. On instructions from the Secretary of State for the Colonies, the Veterinary Officers of the Department have been made members of the Colonial Veterinary Service, and from the 1st January, 1937, they are to be known as:
Senior Veterinary Officer.
Government Veterinary Officer (attached to the Government Stock Farm, Trinidad).
Government Veterinary Officer (stationed in Trinidad for veterinary duties).

4. An application has been made for the newly appointed Veterinary Officer in Tobago to become a member of the Colonial Veterinary Service.

5. Three visits to the island ward were paid during the year, one by the Senior Veterinary Officer, and two by another Veterinary Officer before the new Officer assumed his duties there at the end of the year.

6. Paralytic Rabies in livestock (transmitted by the bat) was again responsible for a number of deaths in animals in Trinidad, but it is pleasing to report that the number of cases is the lowest on record since the big outbreak in 1929—there being 217 cases as compared with 331 in 1935. The incidence was again highest in the Northern Area (168), but 35 cases occurred in the Southern Area.

7. The expenditure for the bat investigation sub-division, including the vote for the destruction of bats, was transferred to the Medical Department this year. The Zoologist in charge had to resign during the year on account of ill health, and his appointment has not been filled.

8. A Rabies Inspector from the Medical Department was attached to the Veterinary Department during the year to assist the Veterinary Officers in their field work with Paralytic Rabies.

9. The research work in this disease was again carried out by the Government Bacteriologist, who is also working on the disease from the human aspect.

10. I attended all the meetings of the Board of Agriculture (5), and presented reports on Paralytic Rabies for the information of the Board: these reports were published in the daily papers and printed in the Minutes of the Board.

11. There was only one meeting of the Veterinary Registration Committee, of which the Government Veterinary Surgeon is Chairman, to deal with an application for registration which was granted.

12. The Government Veterinary Surgeon is a member of the Nutrition Committee which was appointed on the instructions of the Secretary of State to deal with the question of nutrition generally in the colony.

13. A Livestock Exhibition organised by the Agricultural Society was held towards the end of the year (30th October - 1st November) in the Race Stand and Paddock of the Trinidad Turf Club on the Queen's Park Savannah. It was a great success, the total number of exhibits was about 500. The thoroughbred stallions, the dairy cattle and the poultry all deserve special mention.

14. The Department imported from England during the year for the Government Stock Farm, the thoroughbred stallion "Young Native" (1929) by Junior out of Mollusca by St. Frusquin, a winner of nine races in England including the Newbury Spring Cup of £1,420; 2 Large Black gilts in pig; a British Alpine Goatling and White Leghorn poultry. Two Berkshire gilts in pig and Poultry (Rhode Island Reds and Barred Plymouth Rocks) were also imported from Canada.

15. The Government is greatly indebted to Mr. C. W. H. Glossop for his gift to the Government Stock Farm of a pure bred Holstein Friesian bull calf from his well-known Lund Herd in Doncaster, England.

16. The Water Buffalo is fast replacing Zebu cattle as the working animal on the large sugar estates: they are also being used by some of the large cane farmers and to a limited extent by the peasantry. Through the Department, 8 bulls and 7 cows or heifers (Murrahs), of which two of each sex are for the Stock Farm, were ordered from India, and they were shipped for Trinidad from Calcutta on December 1st. They were selected personally by Mr. Wynne Sayer, the Imperial Agriculturist, Pusa, to whom the Department is indebted.

17. The Animal Husbandry Committee of the Agricultural Society held several meetings during the year, and prepared a report to be submitted to Government early in 1937, with a view to encouraging the rearing of livestock more generally in the colony. The Government Veterinary Surgeon, as well as another Veterinary Officer (Assistant Officer-in-Charge of the Stock Farm) are members of this Committee, and they also served on the Committee of the Livestock Exhibition.

18. During the year lectures were given by the Government Veterinary Surgeon to the Agricultural Society, Port-of-Spain; the students of the Naparima College and the San Juan District Agricultural Society. Another lecture on the value of an annual livestock exhibition was given by the Veterinary Officer attached to the Government Stock Farm.

19. Lectures and practical demonstrations were also given to candidates for the examination of the Royal Sanitary Institute—Sanitary Inspectors and Food Inspectors.

20. The Government Veterinary Surgeon attended two meetings of the Examiners of this Institute held in Trinidad, and also acted as an examiner for the Food Inspectors' Examination held at this centre during the end of the year.

Proclaimed Diseases.

Anthrax.

21. Seven cases were reported and investigated in three different areas, five on sections of the Caroni Sugar Estates, Ltd., one on the Woodbrook foreshore on grazing grounds belonging to the Port-of-Spain City Council and one on a cocoa estate (El Rosario) in the Rio Claro district. The necessary preventive measures were enforced after proclaiming the areas, and the incontact stock were all vaccinated wherever possible. In the case of the Caroni area all the estate animals were vaccinated and those of some cane farmers as well. Owing to cases occurring on the Government Stock Farm in 1935 (August), all the stock at this Institution were again vaccinated against the disease this year. Four hundred and ninety-four head of Venezuelan cattle were vaccinated during the year, before they were allowed to leave the Quarantine Station.

Glanders and Epizootic Lymphangitis.

22. Two cases of ulcerative lymphangitis were reported as suspected cases of Epizootic Lymphangitis during the year. No cases of Glanders occurred.

Swine Fever.

23. There were no cases reported.

Foot and Mouth Disease.

24. Sanction was given by the Department to import a pure bred Holstein Freisian Bull calf and a pure bred British Alpine goatling from England, the former undergoing its quarantine period at the Ministry of Agriculture Laboratory at Weybridge and the latter at the Quarantine Station at the Port of London. Permission was also given to the St. Lucia Government for a pure bred Sussex Bull calf to be landed in the colony intransit for St. Lucia, and to undergo natural immunization against Piroplasmosis at the Stock Farm. The Bull was accompanied by a clean bill of health. Fifteen head of Water Buffaloes (8 bulls and 7 cows or heifers in calf) were ordered from the Imperial Agriculturist, Pusa, India, on the condition that they were passed by a Government Veterinary Officer before shipment and subject to a period of detention on their arrival in this colony in January, 1937.

Tuberculosis.

25. Fifteen cases were recorded during the year, and they were all destroyed. Five cases were discovered at the Abattoirs (2 in Port-of-Spain and 3 in San Fernando). All the incontacts were traced in their respective districts and tuberculin tested with negative results. Four hundred and twenty cowsheds in the rural districts around Port-of-Spain containing 1,089 cows and heifers were tested by this Department during the year, and there were four reactors—the animals were slaughtered and the owners compensated. All the cattle at the Government Stock Farm were tested three times during the year and there were six reactors with localised lesions.

Rabies.

26. Twenty-one dogs were quarantined against Rabies on arrival in the colony, including two intransit during the year. Only one cat (intransit) passed through the Station. One dog died from the gastric form of Distemper during its period of quarantine. There were no cases of Rabies in dogs in the colony.

Paralytic Rabies in Bovines, &c. (Bat-transmitted).

27. The disease was again in Trinidad responsible for a number of deaths, chiefly in bovines, but also in horses, mules, donkeys, as well as a few smaller animals—no dogs were affected. There were 217 cases, as compared with 331 in 1935, and the incidence was highest in the Northern Area as in the past two years. The distribution can be summarised as follows:—

A. Northern Area (59 in Sangre Grande, 21 in Toco, 34 in Diego Martin) ..	168
B. Central Area	14
C. Southern Area (21 in Tabaquite-Rio Claro district)	35
	217

28. The disease was controlled by :
(*a*) Vaccination of livestock.
(*b*) Destruction of bats by shooting and poisoning.

The number of animals vaccinated was 7,500 and only 6 cases occurred in protected animals. The vaccine was supplied by the Connaught Laboratories, Canada, and arrangements have been made for a supply from the same source in 1937. This work was again done for the peasantry free of any cost, and in the case of estate proprietors, they were charged the cost price of the vaccine. The destruction of bats was carried out by the Medical Department, and during the year about 5,000 bats were destroyed, of which approximately 4,000 were the Desmodus species (blood-sucking). The Government Bacteriologist examined during the year 1,780 bats and found Negri Bodies in 98 (97 Desmodus species and 1 Artibeus—fruit-eater). The distribution of the disease in bats is widespread, existing in all parts of the colony, and the incidence was higher than last year. Professor Urich in charge of the bat investigation work, who, as already reported, unfortunately had to retire on account of ill-health, stated during the year that there was no evidence to show that bats migrated to Trinidad from the mainland of South America.

Non-Proclaimed Diseases.

Strangles and Influenza.

29. All horses and mules imported from the U.S.A. were Mallein tested, as well as vaccinated against Strangles and Influenza, before shipment. The incidence of both these diseases was again low, and there were no outbreaks on the sugar estates. There was an epidemic of coughing amongst race horses, followed in several cases by Influenza, chiefly during June and at the end of the year, and the same condition occurred among riding horses on some of the estates.

Tetanus.

30. There were very few cases. The Veterinary Officer in charge of the largest sugar estate in the colony reports the excellent results obtained by using Tetanus Anti-toxin as a preventive measure in all cases with wounds on horsekind.

Ulcerative Lymphangitis.

31. Although we had a wet year it is pleasing to report that very few cases came under observation during the year : the early treatment of wounds with regular dressings has kept the disease, which chiefly occurs in large mules in muddy districts, under control.

Dermatitis in Horsekind.

32. This was again prevalent among brood mares and other horsekind when turned out to graze during the rainy season. The irritation cleared up as soon as weather conditions improved.

Parasitic Gastritis in Calves.

33. This condition was prevalent during the year owing to the heavy rains, especially on badly drained pasture lands. On several occasions this disease was reported as paralytic rabies by stock-owners due to the fact that animals in a state of debility were unable to rise and struggled on the ground. Stock-owners have been advised again that the Copper Sulphate treatment must be carried out regularly, especially during the wet months.

Pneumonia in Calves.

34. This disease is chiefly seen in dairy cattle where the calves are housed most of the time. Very few cases were reported during the year.

Bovine Piroplasmosis.

35. The young pure bred Holstein Friesian Bull calf imported from the Carnation Farms at Seattle, Washington, in December, 1935, developed the disease following natural immunization but responded to treatment (Intravenous injection of Piroblue) and has done quite well since. Although his temperature was recorded daily over many months no anaplasmosis reaction was observed and the parasites could not be detected in his blood. A pure bred Sussex Bull calf was landed in the colony during the year intransit for St. Lucia to undergo natural protection against Piroplasmosis. The bull did not show any clinical symptoms of the disease whilst undergoing immunization.

Contagious Abortion in Cattle

36. The disease occurs chiefly in the large dairies where cattle have been introduced in the past from outside the colony. At the Government Stock Farm a formalised—killed—vaccine imported from Cambridge was used during the year, but the results so far are not encouraging as eleven animals aborted.

Ophthalmia in Calves.

37. This condition frequently follows overcrowding in pens, and it appears to be fly-transmitted. Several eyes are lost following the rapture of a corneal ulcer. Preventive measures, including sanitary conditions of calf pens and avoiding overcrowding, are meeting with success by stock-owners, and early treatment with an eye lotion containing 6 grains of Zinc Sulphate to the ounce, as soon as weeping from the eyes occurs, is recommended.

Importation of Animals.

38. The following animals were imported into the colony during the year and inspected :

Horses—including the thoroughbred stallion " Young Native " for the Government Stock Farm, 9 thoroughbred fillies, 10 American saddle horses, 72 working ponies from the Venezuelan Mainland and 17 for similar purposes from the Windward Islands ..	162
Mules—including 167 large American mules from Kentucky (U.S.A.), 136 small ponies from Venezuela and 7 for crooking purposes from the Windward Islands	310
Donkeys—including 67 from Grenada and St. Vincent	77
Dogs—including 19 from Great Britain, 12 hounds from America, 2 from Venezuela, 1 from British Guiana, 1 from St. Lucia, 1 from Buenos Aires and 1 from Barbados ..	37
Cats—5 from the United Kingdom and 1 from the Argentine..	6
Cattle—including 1 Friesian bull calf from the United Kingdom for the Stock Farm 1 bull of the same breed from Venezuela, 1 Sussex Bull calf intransit for St. Lucia, 49 head from British Guiana for slaughtering purposes and over 9,000 head from Venezuela for the same purpose	9,614
Pigs—including 2 Large Black gilts from England and 2 Berkshire gilts from Canada for the Stock Farm and nearly 3,000 head from the Windward Islands for slaughtering purposes	3,218
Sheep—chiefly from Grenada and St. Vincent for slaughtering purposes	1,331
Goats—including 1 British Alpine Goatling for the Government, 20 dairy goats from Barbados and more than 3,500 from the Windward Islands	3,787

Quarantine Station.

39. The following animals were admitted to the Quarantine Station during the year :

Cattle	9,194
Pigs	65
Sheep	11
Goats	17
Dogs	21
Cats	1

40. Four hundred and ninety-four head of cattle were vaccinated against Anthrax before they were removed from the Quarantine Station, and twelve head tuberculin tested—all negative. Eleven head of oxen were slaughtered (emergency slaughter) on arrival due to accidents, and 18 deaths occurred (15 oxen and 3 goats). Nine oxen were trampled in the cattle punts during transportation, 2 died from Septicaemia, 2 head of cattle and 3 goats died from exhaustion and collapse, 1 ox was strangled and another died from overdrinking.

41. The revenue derived by Government for the sevices of the Government Veterinary Surgeon for the inspection of animals and for the supervision of the Quarantine Station was as follows :—

Fees for examination of animals on arrival	$ 7,786 24
Grant from City Council, Port-of-Spain	480 00
Fees for animal inoculations	530 16
Sale of rabies vaccine (used in 1935)	326 88
	$ 9,123 28

42. Owing to Paralytic Rabies in livestock (vaccination of livestock, purchase of vaccine from Canada, &c.) it was necessary for special expenditure to be allocated as follows :—

1. Purchase of vaccine and experiments	$ 2,640 00
2. Allowance for assistance	216 00
	$ 2,856 00

H. V. M. METIVIER,
Government Veterinary Surgeon.

REPORT OF MYCOLOGIST, 1936.

General.

It was only towards the end of the year that the prices of the staple crops showed a marked improvement. The result is that even if good prices are maintained, it will take a considerable time for many of the properties to assume anything like normal conditions. This is also reflected in relation to the several diseases of the major and minor crops of the Colony. The almost total absence of an Indian Summer resulted in the wet season being protracted, and this in conjunction with excessive rainfall in November and December has made the prospect for the cacao crop in 1937 unpromising. However, the cacao planters have come in line with other planters in the shape of a subsidy, and this, with the enhanced prices, should make an appreciable difference in many sections of the Colony where this crop has actual or potential value.

2. Another general topic of great importance is sanitation. It is commonly found that planters, as a rule, pay far too little attention to this aspect of crop production. It should be a simple matter for the grower of market garden crops, for example, to keep his land in a thoroughly sanitary condition. No decaying and dead plant material need be left about the several beds. As regards the permanent crops, one sees a great deal of laxity in disposing of infective tissues ; in fact in many cases, the elements of sanitation are ignored. On many estates where witchbroom disease of cacao is prevalent one sees affected pods scattered on the ground and no attempt made to apply sanitary measures. In short, sanitation work is largely looked upon as incidental and of little importance. Until this is altered and growers realize that sanitary work is a real, vital, and integral part of crop production, there will continue to be appreciable and preventable losses.

Cacao.

Witchbroom Disease. (Marasmius perniciosus.)

3. Some extension of this malady is to be reported for the year. The Toco district, which was free of the disease a year ago, has now mild and scattered infection. And unfortunately this area, taken as a whole, is a poor cropping one and many acres are semi-abandoned.

4. As regards incidence of witchbroom, it can be stated that it is increasing in all infected areas. However, there are still substantial acreages where the affection is absent.

5. As evidence showing the increasing degree of incidence in a three year period, viz. 1934, 1935, and 1936 on 24 cacao estates situated in heavy and medium infected districts, the returns show :—

1934.	1935.	1936.	100 tree block.
No. of Witchbrooms, 19,297	38,021	62,192	The same one hundred cacao trees on each of the 24 estates are checked monthly.

Marper (Government) Estate.

6. The method of controlling witchbroom on this property is to collect and destroy all diseased tissues in alternate months. The number of these tissues during 1936 was 448,500 as against 166,495 the previous year, *i.e.*, the figure was approximately trebled. As a general statement, this trebling of incidence is supported by the data in the last section and is propably an index of what is happening on infected properties taken as a whole.

7. It is interesting and informative to note the crops of cacao at Marper since the Government purchased it. There have been seven complete years and in spite of witchbroom and other diseases and pests, the average crop has been two and half (2½) bags (of 165 lbs.) per acre. This rate of cropping is probably twice that of the average for the Colony.

8. The cost of controlling witchbroom at Marper during 1936 was $5.40 per acre. This includes supervision. Last year (1935) the cost was $4.00 per acre, with supervision. Now Marper estate has a large number of experiments and these require separate working and checking, including the witchbroom records. As a result, the figure for witchbroom control is higher than an ordinary commercially worked estate would be called upon to pay in similar circumstances. It is probable that effective control work could be done in medium to high infected areas at a cost of between $3 and $3.50 per acre.

9. It will be seen, therefore, that the control of the disease is largely a question of economics. Given good cacao prices, also cacao which is relatively young and high cropping, in good soils and satisfactory supervision, then success can result. It would seem that a limitation of lands in cacao must eventuate in the Island before very long because of low cropping, witchbroom, &c., which are found in many districts.

Trees Resistant to Witchbroom.

10. Some 200,000 cacao trees have been under observation in heavily infected districts for a considerable time with a view to trying to determine if any of them were highly resistant to the disease. By a process of elimination, a dozen trees remain with which further experiments are under way. Pods and budwood are being taken from these trees and set out in a nursery in a heavily infected district.

Witchbroom Observation Plot.

11. In one of the heavily infected witchbroom districts, a block of 100 cacao trees are under observation to determine the daily production of sporophores (mushrooms). The majority of these trees are small and easily accessible. It may be noted that this block and a considerable area surrounding it have had practically no attention for some years, hence witchbroom has been accumulating year by year.

12. Observations were commenced in August and it is the intention that they be continued throughout a whole year.

13. The data to hand at the end of the year reveal :—

Month.	No. of Sporophores.	Rainfall (In Inches).
August	1,010	10.10
September	4,805	12.77
October	19,395	9.39
November	6,373	17.37
December	9,084	15.04

14. From the above, it will be seen that so far as these records show, the month of October was strikingly significant in mushroom production. It is known that very wet weather—and also dry weather—is inimical to mushroom production ; the ideal condition which favour fructifications is showery weather. But the high figure for October may be correlated with a drop in temperature.

15. Taking the above figures of mushroom production, one sees that even in August the rate was upwards of 3,000 per acre ; and the October record was yielding 60,000 mushrooms per acre.

16. It must be remembered that one of these mushroom can produce anything between 10 and 20 million spores, and that one spore can produce a " broom " or a witchbroom pod. It is this condition of affairs which explains the severe incidence of the disease in certain areas.

17. After upwards of eight years of propaganda, the planting community are fairly conversant with the vegetative phase of witchbroom disease, because of the obvious contrast from healthy tissues. But the significance of the reproductive aspect of the disease is still far from being appreciated and understood by the average cacao planter.

18. From the time witchbroom was discovered in Trinidad in 1928, it has been continually urged that if the disease is to be reasonably controlled then mushroom production must be kept at a minimum. If this is not done, little success can result. It is futile to hope to succeed in a combat where mass production of mushrooms is operating.

Witchbroom disease and loss of crop.

19. For the purpose of securing more accurate data regarding the percentage loss of mature pods throughout the whole period of the crop, arrangements have been made for a count of all pickings on a number of fields in the different districts where the disease is markedly in evidence. The unit on each estate for this work is ten acres. The whole of Marper (92 acres) Government Estate in Manzanilla is one of the properties included in this investigation. It is important to emphasise that considerable losses of immature pods are constantly occurring as a result of witchbroom, but no account is taken of such loss because it would be impracticable to do so.

20. By the end of the year several pickings had been made on eleven selected properties, and the average loss was thirty-three per cent. of the crop.

21. The lowest percentage loss was 8 and the highest 67 per cent. On Marper Estate the loss at the end of the year was approximately 6 per cent.

22. This work of checking percentages will be continued ; and it should be mentioned that on each property where these counts are made an officer of the Department is present to supervise the work so as to assist in accurate recording.

Bananas.

23. Some extension of planting of this crop—the Gros Michel variety—is to be recorded during the year.

24. Most of this has been done by large estates; scattered blocks of 3 to 5 acres being established. The small-holders have been mainly engaged in exploiting sporadic stools which have long been growing in their properties.

25. When the banana project for exporting Gros Michel was started there was a general feeling that abundant suitable land was available for the crop. But experience has shown that only very limited areas can be classed as good soils for this crop. Hence it is most important that very careful soil selection work be undertaken before establishing bananas commercially. Much disappointment has already resulted from more or less indiscriminate planting. In some instances, only a meagre crop has been reaped from the first plantings; in other cases, a marked decrease has resulted in the first ratoons. And in all of these instances, soil poverty has been a main factor for the failure.

Diseases.

Panama Disease (Fusarium Cubense).

26. Banana growers were warned at the inception of the commercial growing of the crop that this disease would be a constant menace. Many planters have experienced the validity of this statement. Planters are urged to give more prompt attention to the early cases of this disease. If this were done there would be far less group infection. Banana Disease Killer Oil is available in all the planted areas and officers of the Department resident in these zones are always available to help in giving information and assistance in the methods of treating diseased stools.

Moko Disease (Bacterium solanacearum).

27. This disease is curious in its distribution. Some areas have practically none; other districts show a relatively high incidence. The organism involved is a soil inhabiting one and one finds most trouble in lands which until fairly recently were in high woods (forest). The control measures for this disease are the same as those for Panama Disease.

Leaf-Spotting fungi (Cercospora musae).

28. This specific fungus parasite is found to be widely distributed on various varieties of bananas. Up to the present the Giant Governor, Governor, Gros Michel, and Sucrier are known to be affected, and, with two or three exceptions of potentially good districts for banana growing, it can be stated that practically all areas have this particular parasite present. Other banana growing Countries are also finding this species of Cercospora doing great damage.

29. The fungus in question forms lenticular spots on the leaves. These spots are about one-quarter to one-half inch in length and the width varies from one-eighth of an inch to one-quarter inch. Where young leaves are attacked, the spots are somewhat larger.

30. It appears that this specific parasite has a lengthy incubation period, may be for two or more months.

31. Eventually the centre of the spots assumes a grey-white colour and when conditions are favourable then sporulation sets in. Fructifications are found on both surfaces of the leaves. Large areas of leaf tissues are eventually killed by the parasite and it is this phase of premature failing of the leaves, especially immature leaves, which constitutes a serious danger and results in great loss.

32. Dissemination of the fungus is undoubtedly mainly wind-borne aided to some extent by splashing of rain water.

33. It is noteworthy that in Fiji, Queensland, Surinam, Honduras, and in parts of Jamaica, this species of Cercospora has assumed the role of a serious economic parasite and great losses of crops have been the result. And it would seem that in parts of Trinidad this leaf-spotting fungus may prove to be a limiting factor in banana production.

34. Control measures in some of the above mentioned territories have so far been largely unsuccessful. Spraying, dusting, wider spacing of plants, stripping and burning or burying infected foliage have all been tried but with little success.

35. For the control of the trouble locally one is diffident in making recommendations in view of the non-success of multiple control measures tried in other countries. But on general grounds one can advocate an experimental programme of invigorating affected plants by improving the tilth and adding manures where possible. Also it should be sound policy to rid the cultivations of surplus suckers as they harbour the parasite in quantity and thus jeopardise the fruiting possibilities of the older cropping plants.

Cordana Spp. and Helminthosporium Sp.

36. These fungi are also present in many districts but their incidence and economic significance are of a minor nature.

Water-soak.

37. In one district in Trinidad many of the Gros Michel stools show discoloured vasculars of a blue-black colour in the central tissues of the rhizome. It was inferred, when first encountered, that some disease organism, was the cause, but investigation reveals that no parasite is present. To test the matter further, two planting experiments, in collaboration with the Banana Officer, were set up.

38. *Experiment* 1:—Three normal, healthy "bits" showing no discoloration were planted in a bed possessing a good supply of compost and alternating with these, three "bits" showing discoloured central vascular strands. All the stools grew normally and produced good bunches of fruit.

39. *Experiment* 2:—Six "bits" considered to be quite healthy and showing no discoloration were planted in a block. Planted alternately between these were six "bits" revealing discoloration of the central vasculars. In addition, another six "bits" presumably quite normal and healthy were planted in a block and in an adjacent block another six "bits" showing central discoloration, were planted. The plants in this latter experiment are still immature, none having as yet flowered. But there is no apparent difference between the two types of selected "bits"; all the plants appear healthy. Observations will continue to be made on them. At present this trouble which is considered to be a form of water soak is classed as physiological.

Tonka Beans.

40. The maintenance of good prices has given an added stimulus to the growing of this crop. But unfortunately a large percentage of the seedlings make only very slow growth ; and many of them require resupplying. It is felt that much of this failure and retarded growth could be avoided by greater care being taken in the planting and maintenance. For example, a few planters, with no particular advantage of soil, have plants at the age of 18 months to 4 years which are two or three times the size of those found on several other estates. Success is largely dependent on routine attention to weeding, mulching, and manuring.

Thread Blight.

41. This affection, which can be serious in wet districts where shade is excessive, still persists in certain reas. But it has been demonstrated that effective control is possible by reducing shade and collecting and destroying diseased tissues.

Transplanting Experiment.

42. It was recorded in the last report that an experiment in transplanting trees of this crop was being prosecuted by one planter. The idea is to see if this can be done successfully where the trees are closely planted and thus retarding each others growth and cropping. Close planting is common in this Colony and many planters are remedying this by destroying trees by a process of thinning out. However, if a reasonable amount of success is possible by the method of transplanting it is well worth the effort.

43. It is interesting to record in this connection that the planter undertaking this experiment transplanted 110 trees in October and November, 1935. This was done without cutting back (pruning) of the twigs and branches. At present, 40 of these transplants survive and some of them are flowering and fruiting.

44. When the wet season of 1936 was definitely in evidence in June and July, an additional 33 trees were transplanted after heavy pruning of the branches. Of these transplants 14 have survived.

45. It is unfortunate that in the above work only very poor land was available in which to do the transplanting ; otherwise it is quite likely that a larger number of survivals would be recorded.

Citrus.

Citrus Scab. (Sphaceloma fawcetti).

46. At the end of the year this disease was discovered in the grapefruit cultivations in the Santa Cruz Valley. In this particular area, Marsh grapefruit, ranging in age from 4 to 7 years, is established to the extent of upwards of 300 acres in what was formerly cacao fields. Mild infection of the foliage of upwards of 1,000 trees was found.

47. The fungus parasite responsible for the disease has been present in Trinidad for generations ; in fact its existence is probably co-extensive with that of sour orange and rough lemon trees.

48. Citrus growers are all more or less familiar with scab, particulatly in relation to the budding of grapefruit and oranges on scab infected stock. And most people know that sour orange and rough lemon trees, almost always are infected with " Scab ".

49. Fortunately, the scions budded on sour orange and lemon stocks have almost invariably grown quite healthy and free from the scab parasite. Only very occasionally is a budded plant found with slight scab infection.

50. This particular fungus parasite was first found by the writer on grapefruit in Trinidad in 1922 in the Diego Martin district. The plants on this site were imported from Florida. At that time a few miscellaneous grapefruit trees were infected, some of which were the Marsh variety. It should be stated that citrus authorities class the Marsh grapefruit as being moderately susceptible to scab disease.

51. Since 1922, the writer has found the same fungus on King Orange and Curacao orange ; and in addition, at long intervals, when inspecting nurseries, one or two budded plants have been found infected with the disease.

52. The parasite attacks only young, immature tissues (leaves, shoots, and fruit) with a result which is quite familiar to citrus growers as revealed in its effects on rough lemon and sour orange trees.

53. The spores of the fungus are mainly distributed by wind ; and rain, dew, insects, birds, &c., aid in the distribution.

54. Considerable research work has been done in other countries on this parasite and it is found that temperatures ranging between 58 and 75 Fahrenheit are essential for the fungus to effect damage. Other essential factors for the parasite are, as stated above, young susceptible tissues and also an abundance of moisture on the surfaces of these tissues. All these three requisites are necessary and are required to be operating at the same time for effective damage to result.

55. Indications in the Santa Cruz Valley are (1) that the trouble is quite recent, *i.e.*, within the last few months because old lesions appear to be practically absent and the maturing fruit is almost scab free ; (2) that heavy depositions of dew characterized this Valley and this may be an important factor in inducing incidence.

Control.

56. It is highly desirable that all grapefruit cultivations should be carefully inspected for signs of the disease. Any infected tissues which may be found, should be collected and destroyed. If the disease persists and increases, it will probably be necessary to adopt a spraying schedule ; but the kind of spray will depend on a careful calculation of the incidence of scale insects and associated entomogenous fungi.

57. All planters can assist in reducing the amount of the inoculum by destroying infected rough lemon and sour orange trees. Large numbers of these trees which are to be found throughout the Island, harbour the parasite in great abundance. Some citrus planters have commenced this work already and the whole community should assist.

58. The Department has taken steps to have propaganda work done on the above lines and to make surveys ; also Government has proclaimed the disease a notifiable one.

59. The above is simply a statement of facts and the importance of taking precautions is urged. It may well be that when all the grapefruit cultivations have been searched, other districts than the above-mentioned may be found infected.

60. At the moment, considerable areas in grapefruit in the Island have no record of this disease and it is quite possible that they may remain free of the trouble. But it is sound policy to rid citrus cultivations and other areas of highly susceptible trees such as rough lemon and sour orange which are found infected. It may be mentioned that practically all kinds of oranges grown in Trinidad with the exception of those abovenamed, are apparently immune to scab disease.

61. A further possible factor in the control of the disease is the system of manuring. It is claimed by some of the citrus growers in Porto Rico where the disease has been present for many years, that the use of potash induces resistance to this particular affection. Citrus planters in Trinidad, will no doubt, give attention to this phase of control, if found necessary.

MISCELLANEOUS.

Visits.

62. Tobago was visited for a period of eight days. The main object of the visit was to discuss with the planting Community and others the best means of improving the Plant Importation Regulations. It was felt that several adjustments were desirable, and it is hoped, in due course, to bring the regulations more up-to-date. Opportunity was taken during this visit to inspect some of the crops in relation to diseases.

63. On the whole, the cacao cultivations were found in fair shape, though naturally, as a result of the long slump, some signs of neglect were to be seen.

64. There is, to date, no record of witchbroom disease in Tobago; and other maladies of the crop are far less in evidence than one finds in Trinidad.

65. In certain areas, Panama Disease of the Gros Michel banana is present; in some districts however, the disease is still apparently absent. It is important to stress the need of prompt treatment of diseased banana stools if one wishes to keep incidence at a low point. Too often the early cases are neglected with the result at a later date that general infection follows. It is surprising that more attention is not given to growing plantains in Tobago for consumption locally and in Trinidad. It is true that weevils are a menace, but one would like to see real sustained efforts made in this direction especially in areas where rich soils are found. Control measures for weevil infestation are known and should be utilized if the proposition is promising.

66. A short visit was made to the Cedros district to study the situation of the Coconut Industry following the hurricane of 1933. It will be remembered that great loss of trees resulted from the hurricane and suitable lands were replanted in the same crop. In general, the Cedros district is in a comparatively low rainfall zone; but the moisture is supplemented by underground supplies. The young plants have been somewhat retarded in growth by sub-normal precipitation, but taken altogether, they are of moderate growth.

67. It will be necessary for the planters to keep a keen watch for the Red Ring pest as the trees get into the adolescent stage. It will be very surprising if this pest does not appear sporadically in this large replanted area by the time the trees commence to crop.

68. As usual, much time was spent in inspecting the various crops in the different districts of the Island. It was gratifying to find, especially towards the end of the year when prices of produce improved, a marked revival of interest and attention being given to much needed work in the control and treatment of diseases.

Papaw. (Carica papaya).

69. This plant is grown in a scattered way in most parts of the Colony. No attempt, known to the writer, has been made to grow the crop in a cultivated manner; and it is quite likely that if such an attempt were made, it would be short-lived. Serious diseases of the crop are (*a*) Mosaic, a virus disease; (*b*) Stem Canker and (*c*) Asperisporium leaf disease. (*a*) and (*b*) can be serious even in scattered plantings; (*c*) is usually relatively unimportant. One can visualize serious trouble and subsequent damage from the above-named diseases once a pure stand of the crop was attempted.

Coconuts.

Red Ring.

70. As compared with a number of years ago, this pest is not nearly so much in evidence. This is explained by the fact that this malady is pre-eminently one of adolescent trees; young non-bearing trees are usually free of the pest and trees upwards of say 12 to 14 years are not generally affected.

Wilt.

71. This is by far the most serious affection of the crop. Trees between the age of 15 and 25 years are the ones which most commonly fail. What is known as the central plain—land formerly in sugar cane—is a striking example of coconuts failing from this trouble. It would appear from the data available that this affection is a physiological one. Experimental work is still under way on the problem.

Pestalozzia Sp.

72. This is a fungus parasite of the leaves which in some countries does definite and serious damage, especially on young plants. Locally, the fungus is to be found occasionally on bearing trees in exposed positions and where the soil is poor. But even in these cases one cannot say that appreciable loss is operating. In such instances as the aforementioned, the indications are that improved cultural measures such as draining and manuring will rectify the positions. Fortunately in this Colony, damage to young seedlings as a result of attack by this parasite, is practically negligible.

Sugar Cane.

Mosaic Disease.

73. From recent reports, the central sugar cane belt with Couva as a centre, is still the area of highest incidence. Slight and scattered incidence occurs in the northern cane belt, and in the large southern zone where the crop is grown, incidence is apparently absent or unrecorded. This affection which caused considerable alarm about 1920 when first identified, has never made much headway locally. For one thing insect vectors appear to be almost absent; hence secondary infection is scarcely operating. Government maintains a small staff to instruct cane farmers regarding the roguing of infected plants. The persistence of the trouble is mainly caused by the planting of infected cuttings.

Coffee.

Thread-blight.

74. During the year coffee bushes, especially the arabica variety, have been heavily infected, in many places, with this disease. It is an annual occurrence and the incidence is heaviest in wet periods. Much could be done to control the trouble by reducing the shade where feasible. Coffee is largely grown as an interplanted crop; hence excessive shade is often found in areas where multiple crops are growing.

American Leaf-spot. (Omphalia flavida).

75. The same remarks apply to this affection as in (1) above.

Cauliflower.

Leaf Disease.

76. In some districts near Port-of-Spain market gardening is in operation. Recently a few small-holders commenced the growing of cauliflowers. A few of the plants have failed from a bacterial disease of the leaves. Probably the causal organism is *Bacterium maculicola*. It is quite possible that the affection is seed borne; hence it is desirable that seed for planting should be treated prior to planting.

Control.

77. Strict sanitary measures should be exercised by all growers. Such measures are within the means of all small-holders. All decaying and dead cauliflower tissues should be carefully collected and burnt. If possible, practice crop rotation as a means of assisting in control.

F. STELL,
Mycologist.

REPORT OF THE ENTOMOLOGIST FOR THE YEAR 1936.

In accordance with the arrangement mentioned in my report for 1935, I continued to make my headquarters at the Imperial College of Tropical Agriculture. During the whole year, I have benefited considerably from the co-operation of Dr. A. M. Adamson, Reader in Entomology, to whom my thanks are due.

2. The year's work may be conveniently discussed under the following heads.

Sugar-Cane.

3. A survey was conducted during the 1936 crop season, to estimate the damage caused by the moth borers of sugar-cane, *Castnia licus* and *Diatraea* spp. Observations were carried out on six estates and the results are taken to be representative of the whole sugar-growing area. From the survey it appears that 0·64 per cent. of all cane joints were bored by *Castnia* and 2·63 per cent. by *Diatraea*. Contrary to expectation, it was found that the total injury caused by *Diatraea* resulted in a greater loss of sugar at the factory than did the injury due to *Castnia*. I am indebted to Mr. Kramer of Waterloo Estates for the analyses on which this conclusion is based.

4. While the commercial losses in Trinidad due to borer damage are small compared with those experienced in other parts of the West Indies, it was considered desirable to make an attempt to reduce them still further. Since *Diatraea* injury was more serious than *Castnia* injury and since the only known parasite of the latter insect had proved extremely difficult to rear, it was decided to attempt biological control of *Diatraea* by the importation of foreign parasites.

5. With the aid of a special grant from the Sugar-Cane Investigation Committee, the so-called " Amazon Fly " (*Metagonistylum minense*) was obtained, through the courtesy of the Director and Entomologist of the British Guiana Department of Agriculture. Breeding and liberation of the parasite is now proceeding in Trinidad and, as parasites have been recovered from fields in which the first liberations were made, the indications at the present time are encouraging.

6. Severe outbreaks of the sugar-cane froghopper occurred during 1936, more especially in the northern districts, where the attack is considered the most serious since 1931. In addition to a very large area less severely, but still appreciably damaged, some 1,200 acres of sugar-cane were seriously blighted. In most cases, however, recovery has been remarkably good.

7. In the course of experiments on froghopper control, pyrethrum dusts and sprays showed considerable promise for the destruction of adult insects. In spite of the somewhat primitive apparatus used and other unfavourable conditions, a mortality of 70 per cent. of the adult froghopper population was produced and it seems probable that this figure could be increased with improved equipment. Attention is being paid to the design and construction of such equipment which, it is hoped, will be available for the 1937 wet season.

8. An experiment was conducted by Mr. Fennah of the Imperial College on the relative resistance of various cane varieties to froghopper blight. The results of this experiment are somewhat at variance with previous work and indicate Uba as the most resistant variety studied, while Co.213 was not found to be significantly more resistant than B.H.10/12. The experiment is to be repeated under different conditions in 1937 together with a trial of the progeny of several crosses.

Cocoa.

9. A campaign against vermin infesting cocoa estates was conducted by the Department, in which I have taken part. The campaign was primarily directed against cocoa rats and an effort was made to find an effective poison bait for their destruction. After trials of many different baits and poisons, ripe bananas were found to be a suitable bait and these could be poisoned in a simpler manner by the time-honoured West Indian method of inserting " sulphur matches " into them. Baits so poisoned and exposed in trees subject to attack were found to reduce rat injury very markedly in a short time.

10. Publicity was subsequently given to the problem of rats and their control, by circulars to cocoa planters and others, and suitable matches were distributed to all applicants, apparently with uniformly satisfactory results.

11. A proprietary rat poison known as " Ratin Supplement " was also found to be efficient, but it was more costly and less easily applied than were the poisoned bananas.

12. The possibility of controlling squirrels by means of poison baits was also investigated. Fresh, dry coconut was found to be a fairly attractive bait and it could be poisoned by means of " matches " tipped with a strychnine and gum mixture. This method, however, was not uniformly successful; in certain districts, the baits were readily taken and squirrel damage was much reduced or even stopped, while in other districts, squirrels refused to touch the poisoned bait.

13. Towards the end of the year, an indication was obtained that parrots, which attack cocoa in the south-western part of the island, may also be controlled by the use of poisoned bananas.

14. Serious damage was caused by Cocoa Thrips over considerable areas during 1936 and this has contributed to the serious crop shortage of the year. A scheme of intensive study of the pest has been arranged for 1937.

Bananas and Plantains.

15. The study of banana scars has been continued. Scars of different characteristic types have been recognised and the origin of most of them has been determined. The most important and widespread type is a scarring of the skin of the fruit by scratch-like marks. As mentioned in my report for 1935, this type is most prevalent in bananas interplanted in cocoa. Such scarring is caused by small mammals more particularly associated with cocoa and presents sub-types of injury due to squirrels—(*Sciurus aestuans hoffmanni*), " manicou gros-yeux " (*Philander trinitatis*) and " manicou " (*Didelphis marsupialis trinitatis*). The scarring results from the animals climbing over the bunches in the course of their ordinary progression through the plantation. The same animals will also damage in this way bananas which do not grow in or near cocoa when ripening corn occurs between the banana rows. It was found possible to reduce the damage by the use of poison baits, for which purpose, ripe bananas poisoned with sulphur matches are useful. The baits should be placed in bunches which are already so scarred as to be of no commercial value.

16. Scars of a different type are caused by black stingless bees (*Melipona* spp.), which pierce the skin of green fruits of all ages for the sake of the latex which is thus liberated.

17. On one estate, peculiar scars were observed, of which the causative organism could not be found. The injuries correspond to the description of those ascribed to *Colaspis* beetles. This injury has so far been confined to one locality and to one season.

18. Experiments on the control of the banana weevil borer (*Cosmopolites sordidus*) have been initiated on three estates.

Citrus.

19. Injury due to fruit flies and to the fruit boring moth has been scarce and it has been a matter of difficulty to obtain material for study.

20. Studies on citrus scale insects have been continued. The results of the first year's study indicate that the reproductive rate of both *Prontastis citri* and *Lepidosaphes* spp. is very much greater in the dry season than in the wet season, so that the value of spraying is of greater value in the former season.

21. Emulsions of local oils have received preliminary tests as scalicides, and it would appear that these are likely to be of value for scale control. Such emulsions can be prepared simply and their cost is only a fraction of that of the ready-made emulsions.

22. A poison bait for stinging ants in citrus cultivations has been devised. This takes the form of a sweet jelly, poisoned with thallium sulphate, which is highly attractive to the insects. The bait can be prepared at a much lower cost than similar commercial articles and it is intended that the Citrus Growers' Association should distribute the new product to their members at cost price.

Stored Products.

23. An experiment in the storage of maize and of black-eye peas was conducted on a small scale. While the details of this and of other experiments will be published in due course, it may be said that both products were stored for eight months, without appreciable deterioration, by first fumigating the material and then storing it in tins or bins beneath a covering of fine dry sand. Omission of fumigation or of sand covering quickly led to serious infestation by insects, followed by mildewing and complete destruction of the grain. Storage in bags, with or without fumigation, did not protect the grain from insect attack, but in this case, mildewing was not serious.

24. In connection with the infestation of cured cocoa by *Ephestia*, it has been found that this insect is present in abundance, not only in city warehouses, but also in most drying sheds and store rooms on cocoa estates. Cocoa is consequently liable to infestation before it leaves the estates. In such places, the insect is liable to carry its life history out of the crop season in beans and bean fragments which fall into cracks and crevices of the buildings, where the maintenance of strict cleanliness is practically impossible.

Publications and Addresses.

25. The following addresses were delivered during the year :
- (i) " Insect Problems of Tropical Agriculture " ; Naparima College, San Fernando.
- (ii) " Insect Pests of Garden Crops " ; San Juan District Agricultural Society.
- (iii) " Some Insect Pests of Trinidad, with Suggestions for their Control " ; Agricultural Society of Trinidad and Tobago.
- (iv) " Control of Froghopper Blight " ; Sugar Manufacturers Association, Cultivation Committee.

26. A report on the control of cocoa rats was read to the Board of Agriculture.

27. The following papers were published :
- (i) " Observations on the Early Larval Mortality of Certain Species of *Diatraea* " ; Tropical Agriculture, Vol. xiii, No. 6, pp. 155-160.
- (ii) " The Control of Froghopper Blight " ; Tropical Agriculture, Vol. xiv, No. 1, pp. 5-9.

ALAN PICKLES,
Entomologist.

REPORT OF THE SUGAR-CANE AGRONOMIST FOR 1936.

As in previous years the scope of the work in Trinidad may conveniently be summarised under eight headings :—

1. Manurial Experiments.
2. Cultural Experiments.
3. Growth Studies.
4. Biochemical Investigations.
5. Soil Investigations.
6. Addresses to Planters and Cane Farmers.
7. Miscellaneous.
8. Publications.

1. Manurial Experiments.

2. Some 50 field experiments with lime, nitrogen, potash, phosphate, pen manure and molasses were reaped during the course of the year. The results of these experiments have been set out in detail in my *Annual Report for* 1936 *on Field Experiments on Sugar-Cane in Trinidad* which has been published by the Sugar-Cane Investigation Committee. The main conclusions to be drawn from the experiments are outlined below.

Ground Limestone.

3. It has previously been shown that dressings of coarse limestone (35 per cent. through a 100 mesh B.S. sieve) give rise to a large initial gain in yield of cane, but to small residual gains. The beneficial effects are now known to cease with the fourth crop. It has also been shown that on a degenerated soil the gain in yield from coarse limestone increases over the first three crops. In the following crops, however, the gains have become very small. A finer grade of limestone (65 to 70 per cent. through a 100 mesh B.S. sieve) has now given large and undiminished gains in yield over four successive crops.

4. It has been confirmed that the adverse effects on gain in yield due to liming, which can result from heavy dressings of sulphate of ammonia, may be counteracted, at least in part, by treatment with phosphate, although potash may also be necessary if the soil is deficient in this constituent.

5. Indications have been obtained that larger gains in yield of cane may be obtained by applying lime after instead of before ploughing, but the later application appears to have more adverse an effect on crop quality than the earlier application when moisture conditions are unfavourable to ripening.

Sulphate of Ammonia.

6. Scattering sulphate of ammonia widely rather than closely around the stool has been found to make no difference in the yield of plant canes.

7. Preliminary studies have been made as to the effect of size and time of application of sulphate of ammonia on yield of plant canes. In one case only was a dressing at planting found to be beneficial. Dressings at the breaking of banks led to definite gains. Later dressings, applied in the dry season, not only had an immediate beneficial effect on the yield of plant canes, but also a residual beneficial effect on the following crop. The optimum total dressing of sulphate of ammonia to plant canes has been found to vary between four cwts. and eleven cwts. to the acre according to circumstances. The results obtained on irrigated areas from a series of small dressings of sulphate of ammonia applied at monthly intervals were found unsatisfactory.

8. The varieties B.726 and Uba were found to give greater response as plant canes to heavy dressings of sulphate of ammonia than B.H.10(12) and Co.213.

9. Experiments continued for a number of years on unpenmanured areas of the Naparima marl, red-weathering clay and alluvial (swamp and lagoon) soil types have so far given no indication that the beneficial effects of sulphate of ammonia are diminishing as a result of regular annual applications to successive crops.

Potash.

10. Further evidence has been obtained to the effect that the gain in yield from potash, and the optimum size of dressing of this manure, are dependent not only on the amount of exchangeable potash in the soil but also on the size of dressing of nitrogen. Measures are now available of the effect of varying dressings of sulphate of ammonia on response to potash of plant canes of variety B.H.10(12) on soils containing from 28 to 116 parts per million of exchangeable potash.

11. Plant canes of the varieties B.H.10(12), Co.213, B.726 and Uba were found to give increasing response to a fixed dressing of potash in the order named.

12. It has been shown that the gain in yield of plant canes due to treatment with potash can be seriously diminished in the presence of applied phosphate if the dressing of nitrogen exceed a limiting value. Below the limiting value for nitrogen it would appear that use of phosphate may be necessary to obtain maximum gain from potash.

13. Other things being equal, potash has been found to give greater gains in yield of plant canes and ratoons on limed than on unlimed areas.

14. Although the effect of a single dressing of potash to plant canes has been shown to persist over the following ratoon crops, it would seem definitely advisable to apply potash to first ratoons if this manure is known to have had a beneficial effect on the previous crop of plant canes.

Superphosphate.

15. Late dressings of superphosphate were found to increase the yield of plant canes on an area of red-weathering clay and on an alluvial soil.

Pen Manure.

16. Additional evidence has been obtained to the effect that the immediate and residual gains due to pen manure can be reduced to very small value in the presence of inorganic manures and that inorganic manures alone can give rise to yields of cane as large as pen manure supplemented with inorganic manures.

17. A set of conditions has been found in which inorganic manures gave rise to large gains in yield of plant canes and first ratoons but to small gains of second and third ratoons. The diminution in the beneficial effect of the inorganic manures was found to occur whether or not the plant canes had been penmanured.

18. Further measures are now available of the extent to which gains in yield resulting from treatment with pen manure are reduced by dressings of limestone.

Molasses.

19. It has been shown that dressings of molasses can give rise to large gains in yield of plant canes on a potash-deficient soil. Dressings in excess of four tons appear necessary for the molasses to have a residual effect on yield.

2. Cultural Experiments.

20. Ten cultural experiments on sugar-cane were harvested. An account of them is included in my *Annual Report on Field Experiments for* 1936.

Preparatory Cultivation.

21. Gyrotilling has been found to give rise to no greater yields of plant and ratoon canes than tractor ploughing or chiselling. Tractor ploughing has given definitely superior results to hand forking.

22. On the average planting in furrows in the wet season has resulted in larger yields of cane than planting on the flat. Planting in holes in the dry season also appears preferable to planting on the flat.

Cultivation of Ratoon Canes.

23. Neither mechanical nor hand tillage of successive crops has been found to have an immediate or cumulative effect on yield of ratoons unless the soil is given too fine a tilth prior to planting. In such case it seems necessary to fork the drain edges and at least every other bank to ensure beneficial results.

Mulching.

24. The benefits derived from mulching with megasse were found to be small for ratoon canes in comparison with plants.

3. Growth Studies.

25. The critical studies on the effects of manurial treatment with lime and nitrogen on early tiller-formation have been extended to ratoon canes. Among other things it has been shown that :—

(i) The number of early-formed tillers to the ratoon stool can be increased by more than 20 per cent. by a dressing of limestone (which in this case was applied to the soil six years previously), and by 50 per cent. by treatment with sulphate of ammonia.

(ii) The beneficial effect of lime on early tiller-formation in ratoons is significantly reduced in the presence of applied nitrogen, the extent of the reduction increasing with size of dressing of nitrogen (*see* table).

INTERACTION OF LIME WITH NITROGEN IN RELATION TO EARLY TILLER FORMATION.
RATOON CANES.

Limestone to plant canes in 1930.	Sulphate of ammonia to ratoons in 1936. oz. per stool.			
	Nil.	3½ oz.	7 oz.	10½ oz.
10 tons	9.77	12.11	12.83	12.89
Nil	7.93	10.78	11.52	12.06
Increase from lime	1.84	1.33	1.31	0.83

26. A parallel interaction of lime with nitrogen is known to obtain in relation to yield of cane.

4. Biochemical Investigations.

Crop Quality.

27. An account of the effects of manurial treatment with ground limestone on quality of sugar cane (concentration of sucrose in cane and in juice, 'Brix and purity of juice) has been published in *Tropical Agriculture*, Vol. XII, No. 11, pp. 299-306 ; No. 12, pp. 319-326. The information recorded in these papers covers the period, 1929-36.

28. A summary of the data obtained from the experiments on crop quality harvested this year has been published in my *Annual Report for* 1936.

29. The main conclusions to be drawn from the investigations with limestone and the experiments reaped in 1936 are outlined below.

Ground Limestone.

30. *As long as moisture conditions are unfavourable to ripening, i.e.*, are favourable to continued and active vegetative growth, manurial treatment with limestone can adversely affect the quality of the crop, in that it can depress the concentration of sucrose in cane and the concentration of sucrose and other dissolved solids in the juice . The depression in the amount of sucrose in juice may be proportionately greater than that of the other dissolved solids, in which case there is a fall in the coefficient of purity. Within the limits investigated (one-half to one-and-a-half the lime requirement of the soil) the magnitude of the effect of applied limestone appears in general to be independent of the size of the dressing. The nature of the effect may be explained on the assumption that the applied lime continues to be available to the plant, and aids in promoting vegetative growth late in its life, as long as moisture remains adequate.

31. *When moisture conditions become favourable to ripening*, rather than to active vegetative growth, the effect of applied limestone ceases to be measurable. It follows that the initial adverse effect of lime on the quality of the crop has been overcome by this stage. During the interval the increase in the ratio of sucrose to other dissolved solids, which is characteristic of the early stages of ripening of sugar cane, must have taken place at a greater rate on the limed soil then on the unlimed soil. The nature of the effect of the applied lime during this period may be explained, at least in part, on the assumption that the dressing has facilitated loss of soil moisture, through improvement in soil tilth, thereby rendering conditions even more favourable to ripening. Size of dressing of limestone still appears to be unimportant within the limits one-half to one-and-a-half the lime requirement.

32. *When moisture conditions have become so favourable to ripening that vegetative growth is on the wane*, and the cane begins to dry out, size of dressing of lime becomes of importance. Concentration of sucrose can then attain a higher value on soil treated with an intermediate dressing than on unlimed soil, *i.e.*, the effect of applied lime on this contributory factor to crop quality now becomes definitely beneficial provided that the dressing is moderate in size. An increase in concentration of sucrose, without appreciable change in the ratio of sucrose to other dissolved solids, is characteristic of the later stages of ripening of sugar cane for all soils, irrespective of their lime status. It therefore seems reasonable to assume that the improvement in crop quality which can ultimately result from a moderate dressing of lime is largely due to the continued indirect effect of the dressing on the moisture status of the soil. On soil dressed with lime in excess of its lime requirement the concentration of sucrose was found to be lower in value than on unlimed soil, *i.e.*, the effect of lime applied in excess can ultimately become definitely adverse to crop quality. The adverse effect is probably due to an unbalance in the uptake of nutrients by the crop caused by a relative super-abundance of lime in the soil. It has previously been shown that dressings of lime in excess of the lime requirement can cause a depression in yield of cane. The factors associated with depression in yield of cane are probably also associated with the depression in concentration of sucrose in cane. It is noteworthy that juice purity was not found to be affected by over liming.

Sulphate of ammonia.

33. Dressings of sulphate of ammonia as large as 8 cwts. to the acre have been found to have an adverse effect on the juice quality of plant canes.

34. It has been confirmed that dressings up to 3 cwts. to the acre can have a beneficial effect on the juice of ratoon canes and that dressings larger than 3 cwts. may cause a fall in the concentration of sucrose in cane and the purity of juice of ratoons.

35. It has been shown that late dressings of sulphate of ammonia to first-ratoon canes can lead to more rapid earlier growth, and consequently to earlier maturity, of the crop of second ratoons which follows.

Potash.

36. It has been found that early dressings of potash can have a well-defined beneficial effect, and late dressings an adverse effect, on crop quality of plant canes of variety B.H.10(12) ; also that this manure can have a definite beneficial effect on juice quality of ratoons of B.H.10(12).

37. In a comparative experiment on plant canes an early dressing of potash was shown to lead to a significant improvement in the purity of juice of the varieties B.H.10(12) and Co.213 and a significant fall in the purity of juice of Uba Cane.

Superphosphate.

38. Late dressings of superphosphate were found to have an adverse effect on the quality of plant canes of variety B.H.10(12). Early dressings were found to have an adverse effect on the quality of ratoons of this variety.

Tillage treatment.

39. Under one set of conditions quality of ratoons was found to be independent of the tillage treatment they received.

Leaf Analyses.

40. Investigations on the relationship between leaf composition and soil deficiencies are being extended. Leaf samples have been taken from ratoon canes in a complex manurial trial with the variety B.H.10(12) and in a manurial *cum* variety with the varieties B.H.10(12) ; B.726 ; Uba and Co.213. Analyses are under way of the leaf samples.

5. Soil Investigations.

Manurial Treatment in Relation to Potash Status of Soil.

41. As a result of the field experiments, coupled with soil analyses, it is now possible to make provisional recommendations for manurial treatment with potash of plant and ratoon canes.

Plant canes.

42. Provided that the total dressing of sulphate of ammonia is not less than five cwts. to the acre :—

(i) response in yield to dressings of potash is doubtful if the soil contains more than 90 parts per million of exchangeable K_2O ;

(ii) paying response should result from dressings of one cwt. of potash to the acre if the soil contains from 50 to 90 parts per million of exchangeable K_2O ;

(iii) paying response should result from dressings of two cwts. of potash to the acre if the soil contains less than 50 parts per million of exchangeable K_2O.

Ratoon canes.

43. Provided that the dressing of sulphate of ammonia is not less than three cwts. to the acre paying response should result from dressings of one cwt. of potash if the soil contains less than 70 parts per million of K_2O.

44. It is essential for the potash to be applied early in the life of the plant canes and the ratoons.

Soil Surveys.

45. The field-to-field soil surveys, which were mentioned in my report for 1935, are still actively under way. The manurial programmes with lime and potash of the interested estates are now based on the results of these surveys.

6. Addresses to Planters and Cane Farmers.

Planters.

46. The results of the cultural and manurial experiments harvested in 1936 have been fully explained to and discussed with the Cultivation Committee of the Sugar Manufacturers' Association. The Committee, of which I am Chairman, consists of the senior members of the field staffs of the estates.

Cane Farmers.

47. Talks on cultivation methods and on the use of sulphate of ammonia have been given to representative gatherings of cane farmers. The estates have been very helpful in making arrangements for these talks.

7. Miscellaneous.

48. A visit was paid to British Guiana in February to study the methods of agriculture in use with special reference to irrigation, and to exchange information. Very generous facilities were afforded to me during my visit by Professor J. S. Dash, the Director of Agriculture, and his staff, by the officers of the Sophia Experiment Station and by the Sugar Estates.

49. Two intransit visits were paid to Grenada to supervise the experimental scheme on sugar cane in operation in that island and to decide on its future course.

8. Publications.

Field Experiments on Sugar Cane in Trinidad.
Annual Report for 1936.

Recent Investigations on Sugar-Cane and Sugar-Cane Soils in Trinidad.
III.—Effects of Manurial Treatment with Ground Limestone on Crop Quality and Yield of Commercial Sugar. *Tropical Agriculture*, Vol. XIII, No. 11, pp. 299-306 ; No. 12, pp. 319-326.

P. E. TURNER,
Sugar-Cane Agronomist.

REPORT ON WILT DISEASE OF COCONUTS, 1936.

During the year Wilt investigations were restricted to observations on field experiments laid down in 1934, and further leaf analyses. The results of these studies will be considered generally in this report, as the whole work is being written up in detail and will be published shortly in bulletin form.

Leaf Analyses.

2. As mentioned previously, it appeared from preliminary leaf analyses that, on soils that were liable to dry out seriously during drought periods, palms whose leaves showed a wide nitrogen-potash ratio suffered more seriously from wilt than those with a narrower ratio. Further analyses on samples from such areas tend to confirm this statement. In other areas, where factors tending to interfere with free root development are in operation, this statement does not hold.

Field Experiments.

3. In my previous report it was stated that field experiments had been laid down on three sites to try out trenching alone, and in conjunction with fertiliser mixtures on fields where "Wilt" was progressing rapidly as well as on fields where wilt was likely to occur in a year or so.

4. The following were the treatments tried out :—

(1) Trenching—husks and organic matter.
(2) ,, +husks+Potassium sulphate.
(3) ,, +husks+Superphosphate.
(4) ,, +husks+Ammonium Sulphate.
(5) ,, +husks+Ammonium Sulphate+Potassium Sulphate.
(6) ,, +husks+Potassium Sulphate+Superphosphate.
(7) ,, +husks+Potassium Sulphate+Superphosphate+Ammonium Sulphate.
(8) ,, +husks+limestone.
(9) ,, +limestone.
(10) ,, +Potassium Sulphate.
(11) ,, +Potassium Sulphate+Superphosphate.
(12) ,, +Potassium Sulphate+Ammonium Sulphate.

I.—Fields where Wilt was progressing rapidly.

5. As mentioned before, the treatments have not been successful in checking the progress of the disease, in these instances. The only successes in such cases, have been obtained with the artificial use of water. This has not been tried out on a large scale so far, due to the absence of the necessary water facilities. Arrangements are now being made for such an experiment, and the writer hopes to start the trial in a short time.

II.—Areas in which Wilt was likely to occur.

6. A few deaths occurred immediately after the experiment was started. These have been discarded, as the treatments could not possibly have had time to have any effect. It is possible that the root pruning, as a result of the trenching, hastened the death of these palms, which most likely would have died some time later. Generally speaking, fewer deaths have occurred in the areas where husks or organic matter have been added. The palms also exhibit a much improved foliage and bearing capacity. In treatments 9 to 12, where organic matter is absent, deaths have been particularly severe, in the area where wilt has occurred.

7. In one area the improvement of some trees trenched and pen manure added has been particularly marked. From observations on two trees treated in this way in the early part of these investigations, the beneficial effect of this treatment lasts about three years.

8. As regards differences between the artificial fertilisers added, it is not possible to draw conclusions at present. In different areas, different treatments appear to stand out at present, but the writer feels that it is an effect on yielding capacity rather than on wilt incidence, different treatments showing up according to the soil deficiencies in the respective areas.

General Observations.

9. In the areas subject to serious waterlogging, wilt was very severe during the year. This was most probably due to the abnormally long period over which the rainfall was distributed for the year. This was particularly marked in one area where the disease had not previously occurred, but where drainage had been neglected for about five years.

10. In areas where the soils are free draining and the disease is particularly marked in the dry period, the incidence of the disease was greatly reduced during the year.

11. As mentioned in my last report sugar-cane continues to replace coconuts in the areas seriously affected by wilt, as the soils in these instances are definitely more suitable to that crop.

12. In areas where the incidence of the disease is slight, the present prices which coconut products fetch make it desirable that the cultivation of this crop should continue. The writer is inclined to be optimistic that a programme of field operations can be drawn up which will tend to further reduce the incidence of the disease or at least, add to the age to which the coconut palm can be economically grown in such areas.

F. M. BAIN,
Agricultural Officer.

IRRIGATION STUDIES FOR 1936.

It was possible, with the co-operation of Macqueripe Estates, Ltd., to carry out some preliminary investigations on the irrigation of grapefruit during the year.

2. The major grapefruit crop of the Island comes to maturity in the months of January and February. Under normal conditions, so far, best prices are obtained in the months of September to October, and April to May. It would therefore seem an advantage if the normal crop could be held on the trees for another six weeks, or if trees could be induced to flower a few weeks earlier, thus maturing the crop in September to October. This is of chief concern to areas where the rainfall is about 60 inches, such as obtains on the estate where these trials were carried out. Due to the rains in September and October, picking fruit for transport overseas is a difficult matter and tends to militate against early picking but this is compensated for, to some extent, by a limited local market at that time, when good prices can be obtained.

3. The use of water for holding on fruit is carried out in many countries, and the effect of water, when applied at the right time inducing early flowering has been reported from Porto Rico. Trials were therefore made to test the effect of irrigation, in producing similar effects locally.

Early Maturity.

4. A few trees were selected and a simple trial made. Water was added in varying amounts to trees where drying out of the trees had occurred to a varying degree. It seemed from this trial, that an effective drying out of the soil together with a slight but effective wetting, were the best method of inducing adequate flowering. If the soil had not dried out properly or too much water was added, a large amount of vegetative growth with little or no flowering resulted.

5. As a result of this, a block of 500 trees was allowed to stand until the end of February and then water was run in to the drains, from pipe lines run across the field, to an adequate extent. The result was a large and spontaneous flowering flush on about the 5th of March. Flowering occurred on the unirrigated adjoining block on 20th April, some six weeks later, when the rains came. Fruits were picked from this field in September.

6. About six weeks after flowering some shedding of young fruit occurred, no doubt due to the fact that the trees were unable to bring to maturity the very large number of fruit set. The writer is also of the opinion that there was over-irrigation at this period as well inducing a lack of root aeration.

7. It was therefore possible, by irrigation, to induce early flowering and early maturity of a good crop, with a difference of six weeks to spare from the unirrigated adjoining blocks.

8. The crop generally was early this year and the writer hopes that in a normal year the time difference will even be more marked.

Holding Fruit.

9. At the end of February it was noticed that fruit were being shed on all parts of the estate. A block of 150 trees were selected and water run into the drains by means of a pipe line running across the head of the block. Until the water had penetrated adequately, shedding continued but after a week there was a falling off in the amount of dropped fruit. During March 114 fruit were shed and 77 in April, the average being just over one per tree. In the adjoining block the ground was literally strewn with dropped fruit. The rains came at the end of April and irrigation ceased. At about the middle of May, dropping increased to the extent of ten per tree for the month, and about 12 per tree for June. It was therefore possible to hold on fruit for a period of two months with very little loss. The experiment will be repeated on a larger block, irrigation starting before the period of fruit shedding.

10. On this estate a very large amount of young fruit are shed in the dry spell which usually occurs a few weeks after flowering. Weather permitting, an experiment will be run to see the effect of irrigation in controlling the amount of shedding at this period.

F. M. BAIN,
Agricultural Officer.

PART III.

ANNEXURES.

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PART III—ANNEXURES.

APPENDIX A.

Revenue and Expenditure.

	Expenditure.	*Revenue.*
	$ c.	$ c.
HEAD OFFICE :		
Personal Emoluments	41,155 43	
Travelling and Other Charges	7,349 73	144 00
Laboratory Expenses and Field Experiments	2,008 84	48 00
BOTANICAL DEPARTMENT, TRINIDAD :		
Personal Emoluments	1,759 22	
Maintenance and Improvements, Royal Botanic Gardens and St. Clair Station	6,784 33	
Care of Trees on Government Lands	429 13	
Maintenance, Red House Grounds	406 37	
BOTANICAL DEPARTMENT, TOBAGO :		
Personal Emoluments, Travelling	278 29	
Maintenance, Botanic Station and Government House Grounds	1,599 22	269 14
ST. AUGUSTINE NURSERY :		
Personal Emoluments	3,693 66	
Maintenance and Other Charges	12,226 33	8,772 07
MARPER FARM :		
Maintenance	4,299 16	3,473 06
RIVER ESTATE :		
Personal Emoluments	5,073 74	
General Maintenance, &c.	16,913 83	
Improvements	2,500 47	18,669 79
ST. AUGUSTINE EXPERIMENT STATION :		
Personal Emoluments	3,480 00	
Maintenance, Cultivation of Crops, &c.	7,260 13	484 19
GOVERNMENT FARM, TRINIDAD :		
Personal Emoluments	3,960 00	
Maintenance	23,859 86	
Purchase of Stock (Trinidad and Tobago)	6,226 30	31,970 13
GOVERNMENT FARM, TOBAGO :		
Personal Emoluments	600 00	
Maintenance	3,757 66	1,738 52
GOVERNMENT VETERINARY SURGEON :		
Assistant Examiners and Contingencies	1,618 11	
Paralytic rabies	2,775 55	9,123 28
QUEEN'S PARK AND PASTURES :		
Personal Emoluments	1,145 42	
Maintenance	3,400 28	1,087 30
DISTRICT SERVICE :		
Personal Emoluments, Travelling, &c.	29,750 81	
PLANT PROTECTION ORDINANCE :		
Control of Plant Diseases and Pests	18,876 09	
AGRICULTURAL CREDIT SOCIETIES :		
Travelling, &c.	339 69	
TOBAGO ABATTOIR :		
Maintenance, Travelling, &c.	602 60	240 68
SOIL SURVEY		
Maintenance	1,623 62	
Total	215,753 87	76,020 16

APPENDIX B.

Principal Agricultural Exports, Trinidad and Tobago.

	1936.		1935.	
	Quantity.	Value.	Quantity.	Value.
CACAO :		£		£
Raw Cacao	28,339,195 lb.	487,578	44,387,836 lb.	527,212
SUGAR CANE AND PRODUCTS :				
Vacuum pan, Grey Crystal	118,372 tons	965,334	81,888 tons	636,716
Do. White Crystal	..	..	..	..
Do. Yellow Crystal ..	20,415 tons	260,570	22,355 tons	283,814
Molasses Crystal	..	..	150 tons	2,001
Yellow Crystal Molasses	3,843 tons	45,691	1,304 tons	19,639
Molasses	3,909,009 gals.	41,623	3,199,524 gals.	32,226
Rum	90,185 gals.	20,449	6,282 gals.	3,328
Bitters	8,954 gals.	15,953	16,131 gals.	28,055
COCONUT AND PRODUCTS :				
Coconuts	4,560,180 No.	14,529	5,376,290 No.	14,393
Copra	9,438,240 lb.	51,798	8,764,646 lb.	34,682
Coconut Oil	9,437 gals.	1,343	14,879 gals.	1,339
COFFEE :				
Raw Coffee	1,213,102 lb.	17,702	1,187,867 lb.	18,290
TONKA BEANS	92,719 lb.	31,002	37,968 lb.	12,320
RUBBER :				
Raw Rubber	103,760 lb.	2,825	150,723 lb.	4,215
LIMES :				
Limes	1,391 brls.	2,472	565 brls.	801
Pickled Limes	..	..	..	..
Lime Juice	70,402 gals.	5,079	16,229 gals.	1,199
Lime Oil	22,795 gals.	19,132	1,949 gals.	15,497
Citrate of Lime	23,716 lb.	169	104,037 lb.	901
GRAIN, PULSE, STARCHES, &c.				
Corn (Maize)	34,263 lb.	142	68,544 lb.	242
Peas and Beans	623,980 lb.	2,600	610,536 lb.	2,628
FRUIT :				
Grapefruit	42,958 boxes	41,357	7,724 No.	
			51,119 boxes	42,473
Oranges	3,816,749 No.	4,754	2,850 boxes	
			3,753,446 No.	6,574
Bananas	159,076 No.	14,797	66,369 No.	6,205
Other Kinds	..	149	..	16
MISCELLANEOUS :				
Plants and Seeds	..	403	..	315
Spices (Nutmegs)	16,814 lb.	312	7,620 lb.	83
Honey	38,178 lb.	470	47,198 lb.	392
Live Stock	70 No.	804	64 No.	572
Hides and Skins	3,955 cwt.	6,413	329,435 No.	3,874
Leather (unmanufactured)	2,912 lb.	116	8,017 lb.	234
		£2,060,549	..	£1,700,236

APPENDIX C.

ANNUAL RAINFALL 1862 TO 1936, PORT-OF-SPAIN, TRINIDAD.

1862 to 1899 at the Royal Botanic Gardens. January, 1900 onwards at the closely adjacent St. Clair Experiment Station.

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Rainfall.
	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Inches.
1862 ..	..	.66	.77	.25	1.41	8.47	10.36	9.57	11.97	6.60	10.06	3.03	63.15
1863 ..	1.54	2.71	1.45	.85	1.26	9.12	10.12	10.53	12.11	6.24	4.30	6.57	66 80
1864 ..	2.51	.53	.36	.04	8.15	4.96	7.17	12.06	8.04	6.53	5.94	6.61	62.90
1865 ..	2.62	3.20	1.07	7.98	3.22	5.64	10.35	14.83	7.32	14.62	4.81	9.62	85.28
1866 ..	2.24	3.91	1.44	1.09	1.45	6.59	7.83	12.34	5.87	10.11	8.17	6.82	67.86
1867 ..	1.31	6.36	.83	1.32	2.33	5.30	12.20	15.21	10.45	7.87	.67	2.71	66.56
1868 ..	2.06	.82	3.20	.64	4.17	7.78	11.35	6.73	5.46	4.66	8.31	1.03	56.21
1869 ..	.08	.93	.74	.41	.69	5.52	10.17	8.74	8.86	5.15	6.30	5.87	53.46
1870 ..	2.61	.56	1.46	1.51	4.65	8.81	11.91	9.00	10.63	3.98	5.94	8.29	69.35
1871 ..	6.62	1.40	2.89	.92	3.97	8.84	11.73	12.97	7.87	4.37	10.73	3.27	75.58
1872 ..	1.45	.07	.74	.39	3.14	7.09	5.45	10.82	3.07	4.80	9.89	3.04	49.95
1873 ..	1.78	1.08	1.98	.53	..	4.31	5.04	8.37	5.80	10.34	3.48	1.31	44.02
1874 ..	3.47	1.96	3.67	5.16	2.51	12.28	12.28	11.20	9.38	6.42	3.66	4.29	76.28
1875 ..	3.39	.91	.56	.42	2.61	4.15	12.62	7.22	11.95	10.85	3.74	2.48	60.90
1876 ..	3.26	1.03	1.78	1.67	6.65	11.17	12.23	15.18	12.03	7.04	5.95	3.96	81.95
1877 ..	2.14	..	7.46	3.38	3.19	8.43	8.35	12.94	6.39	6.68	7.66	5.48	72.10
1878 ..	3.44	.70	..	3.22	4.99	5.78	5.42	8.88	11.15	5.89	8.72	3.05	61.24
1879 ..	1.52	2.76	4.56	3.03	3.08	14.92	6.86	10.35	6.15	3.54	4.28	4.38	65.43
1880 ..	11.72	6.53	.67	2.32	3.90	7.83	6.30	17.39	7.47	5.74	10.51	1.96	82.34
1881 ..	.57	.65	.23	1.60	4.66	11.05	7.82	10.90	10.59	3.36	12.06	2.23	65.72
1882 ..	1.33	2.38	.73	1.57	3.74	6.33	5.93	8.40	4.93	5.86	10.29	1.50	52.99
1883 ..	1.56	.71	.26	3.37	5.89	10.91	13.66	10.26	5.53	3.99	6.06	8.30	70.50
1884 ..	3.43	2.50	4.40	1.51	2.91	6.84	5.71	8.70	5.03	5.05	5.14	5.66	56.88
1885 ..	1.30	.89	1.49	.43	5.27	3.44	5.87	4.56	6.08	4.08	5.37	4.44	43.22
1886 ..	3.32	1.97	3.27	3.83	4.49	9.70	17.48	8.15	6.73	12.59	8.54	6.75	86.82
1887 ..	2.69	1.46	1.67	1.08	3.98	7.40	5.51	9.93	5.07	5.84	7.60	11.86	64.09
1888 ..	8.37	1.79	2.41	2.28	3.46	11.92	6.89	7.02	5.53	5.06	7.76	2.95	65.44
1889 ..	.94	.85	4.16	1.05	6.34	11.66	12.14	11.73	3.76	6.30	7.38	7.48	73.79
1890 ..	7.76	.51	2.09	7.62	5.14	9.68	12.89	11.65	3.37	10.98	5.93	5.28	82.90
1891 ..	3.17	.92	.03	1.44	2.54	5.54	11.88	4.26	7.44	5.77	6.66	4.09	53.74
1892 ..	1.93	2.19	1.85	7.59	11.55	16.26	15.55	9.21	3.57	11.49	5.40	4.69	91.28
1893 ..	3.43	1.85	.19	3.61	11.35	10.19	13.28	16.32	11.73	5.47	7.84	7.23	92.49
1894 ..	3.22	2.36	3.12	1.22	2.69	3.26	4.53	12.06	5.48	3.93	7.28	3.16	52.31
1895 ..	2.52	1.33	2,27	2.52	2.11	5.00	2.57	4.86	5.69	10.89	15.15	7.32	62.23
1896 ..	7.08	.88	1.59	2.33	1.62	10.29	6.35	7.66	6.46	6.05	9.81	6.33	66.45
1897 ..	1.67	.75	3.96	.26	5.58	11.19	13.88	7.90	9.83	8.87	9.39	4.40	77.68
1898 ..	3.05	2.18	2.10	1.17	1.49	6.46	5.87	10.55	7.13	6.15	9.13	3.57	58.85
1899 ..	1.95	1.82	1.00	.75	.52	7.63	4.44	8.45	2.18	6.34	8.07	3.61	46.76
1900 ..	3.56	.76	2.72	4.10	4.14	12.99	7.95	11.07	5.52	6.53	5.41	2.61	67.36
1901 ..	1.95	1.51	1.85	.35	6.45	9.21	8.38	7.53	4.26	4.97	7.93	4.83	59.22
1902 ..	2.56	.51	1.18	1.78	2.14	10.05	5.20	11.67	7.22	7.40	2.74	2.89	55.34
1903 ..	1.51	.68	1.54	2.17	.95	5.42	9.40	9.45	11.41	2.12	2.59	4.20	51.44
1904 ..	3.00	2.56	4.24	2.50	2.76	6.23	8.03	4.72	8.81	5.65	3.61	4.32	56.43
1905 ..	2.41	.59	3.74	1.79	4.34	6.01	9.49	11.09	10.43	6.94	10.69	4.16	71.68
1906 ..	.43	.50	.73	.46	7.96	10.95	11.42	8.55	6.54	6.80	5.00	5.64	64.98
1907 ..	5.22	.44	1.71	.09	4.58	11.01	11.02	5.77	7.76	7.65	10.69	4.10	70.04
1908 ..	.75	.45	1.79	.95	5.82	5.22	5.87	7.72	5.45	5.45	2.65	8.68	50.80
1909 ..	5.69	2.43	1.15	1.78	3.87	8.31	10.72	6.29	6.95	7.15	3.93	6.31	64.58
1910 ..	2.79	4.38	1.75	2.01	2.76	6.34	6.40	13.89	8.27	9.21	8.49	1.90	68.19
1911 ..	1.61	1.51	1.86	.74	1.27	7.15	5.20	13.68	4.03	10.22	3.57	3.53	54.37
1912 ..	.62	Nil.	.74	.03	2.18	7.54	12.16	5.56	5.87	2.73	6.28	5.64	49.35
1913 ..	2.80	.50	1.42	.42	1.79	2.80	2.86	6.48	6.52	3.51	8.61	1.82	39.53
1914 ..	.50	.61	1.28	1.01	2.05	7.34	5.05	9.15	7.80	6.14	7.61	5.58	54.12
1915 ..	2.10	.66	..	2.63	2.76	7.05	12.76	5.27	4.21	9.28	7.84	1 75	63.31
1916 ..	5.29	1.35	1.57	1.91	.94	10.30	8.04	11.57	10.78	6.68	9.32	1.98	69.73
1917 ..	1.17	3.06	1.38	.50	4.24	6.30	10.13	9.96	7.24	5.43	6.61	8.22	64.24
1918 ..	3.15	1.18	1.48	1.27	2.94	5.87	14.42	8.56	8.93	5.51	7.56	3.85	64.72
1919 ..	.62	..	1.78	1.67	3.50	6.78	5.17	6.82	7.96	7.79	8.42	6.67	57.18
1920 ..	1.39	1.66	.94	.28	.56	4.13	4.93	6.70	10.98	5.74	6.03	1.60	44.94
1921 ..	2.43	1.60	5.03	4.09	1.43	9.91	10.06	10.30	10.17	6.53	7.71	6.25	75.51
1922 ..	4.01	1.13	1.41	2.39	2.18	6.10	5.06	8.35	6.49	2.92	11.17	7.10	58.41
1923 ..	1.91	1.66	.96	2.97	1.46	3.48	10.76	9.37	6.23	4.41	7.38	7.32	57.91
1924 ..	1.54	.90	.14	1.11	.73	4.95	7.53	7.27	4.59	7.81	8.56	2.15	47.28
1925 ..	1.77	1.06	2.67	.10	1.21	4.20	7.58	8.87	6.37	5.85	5.36	4.36	49.40
1926 ..	.69	.39	.54	.23	2.12	5.26	5.25	10.85	11.20	14.78	9.71	7.56	68.58
1927 ..	4.71	4.44	3.62	5.04	7.15	6.95	9.40	11.67	9.11	6.13	5.64	7.21	81.07
1928 ..	4.22	.69	2.31	2.02	.67	5.75	8.07	8.66	7.36	9.13	8.42	5.94	63.24
1929 ..	.84	.84	1.78	.81	7.33	6.43	5.10	8.90	5.21	3.40	9.30	1.51	51.45
1930 ..	2.70	.08	.31	2.38	1.85	6.35	7.12	4.94	5.82	6.27	2.59	4.87	45.28
1931 ..	1.68	1.11	.07	.29	1.12	6.94	10.96	8.89	4.85	6.59	7.94	5.77	56.21
1932 ..	5.61	1·72	4.33	3.99	9.25	10.53	5.80	16.04	3.85	4.60	10.23	8.01	83.96
1933 ..	3.87	1.25	1.91	1.36	2.85	10.19	9.93	16.07	11.52	7.41	5.38	6.29	78.03
1934 ..	2.51	.90	.74	.17	.82	3.05	9.43	7 24	6.55	8.50	10.08	5.30	55.35
1935 ..	0.53	0.57	1.23	0.42	5.03	2.36	7.35	13.23	11.41	3.82	11.25	3.45	60.65
1936 ..	1.16	0.28	0.11	2.43	5.62	10.52	11.33	5.93	8.13	4.95	7.06	5.53	63.05
and Total ..	203.89	108.67	134.46	138.60	265.52	571.81	655.32	724.98	551.87	495.50	541.34	363 52	4,753.40
. for 75 years	2.70	1.44	1.79	1.85	3.54	7.62	8.74	9.66	7.36	6.61	7.22	4.85	63.38